

SECTION 03 2100
REINFORCING STEEL

PART 1 - GENERAL**1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install concrete reinforcing steel as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
1. American Concrete Institute:
 - a. ACI 318-05.
 2. ASTM International:
 - a. ASTM A 615-05a, 'Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.'

1.3 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings: Reinforcing placement drawings.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver bars separated by size and tagged with manufacturer's heat or test identification number.
- B. Reinforcing steel shall be free of heavy rust scales and flakes, or other coating at time of delivery and placing. Properly protect rebar on site after delivery.

PART 2 - PRODUCTS**2.1 MATERIAL**

- A. Reinforcing Steel:
1. Reinforcing bars shall have grade identification marks and conform to ASTM A 615.
 - a. Grade 60 minimum. Field bent dowels may be Grade 40.
 - b. Bars shall be deformed type.
 - c. Bars shall be free of heavy rust scales and flakes, or other bond-reducing coatings.

2.2 ACCESSORIES

- A. Bar Supports:
1. Type Two Acceptable Products:
 - a. Concrete 'dobies' or blocks wired to reinforcing.

- b. Manufactured chairs with 4 sq in bearing surface on sub-grade, or other feature to prevent chair from being pushed into sub-grade or damaging the vapor retarder under slabs on grade.
- c. Equals as approved by Architect before installation. See Section 01 6200.

2.3 FABRICATION

- A. Fabricate reinforcing steel according to 'ACI Detailing Manual,' 2004 edition, and details on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Site Tolerances:
 - 1. Provide following minimum concrete cover for reinforcement (ACI 318-05):
 - a. Concrete cast against and permanently exposed to earth:
 - 1) Exterior Slabs on Grade (where shown): **2 inches**.
 - 2) Interior Slabs on Grade: **1 inches**. clear from top of slab at **4 inches** slabs, **2 inches** clear at **6 inches** slabs.
 - 3) Sections other than Slabs: **3 inches**.
 - b. Concrete Exposed to Earth or Weather:
 - 1) No. 6 and Larger Bars: **2 inches**.
 - 2) No. 5 and Smaller Bars, W31 and D31 Wire: **1-1/2 inches**.
- B. Bend bars cold.
- C. Accurately place and support with chairs, bar supports, spacers, or hangers as recommended by 'ACI Detailing Manual,' 2004 edition, except slab on grade work. Support bars in slabs on grade and footings with specified bar supports around perimeter and at **4-1/2 feet** on center each way maximum to maintain specified concrete cover. Install bar supports at bar intersections.
- D. Dowel vertical reinforcement for formed concrete columns or walls out of footing or structure below with rebar of same size and spacing required above.
- E. Securely anchor and tie reinforcing bars and dowels before placing concrete. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Avoid splices of reinforcing bars at points of maximum stress. Lap bars 40 bar diameters minimum unless dimensioned otherwise on Drawings. Run steel reinforcing bars continuous through cold joints.

END OF SECTION

SECTION 03 3053**MISCELLANEOUS EXTERIOR CAST-IN-PLACE CONCRETE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Compact sub-base for miscellaneous cast-in-place concrete as described in Contract Documents.
 - 2. Furnish and install granular base for miscellaneous cast-in-place concrete and equipment pads as described in Contract Documents.
 - 3. Furnish and install miscellaneous cast-in-place concrete and equipment pads as described in Contract Documents.
 - 4. Furnish and install sealants and curing compounds as described in Contract Documents.

- B. Products Installed But Not Furnished Under This Section:
 - 1. Light pole base anchors.
 - 2. Satellite dish base pipe.
 - 3. Pipe bollards.
 - 4. Equipment pads

- C. Related Requirements:
 - 1. Section 03 3111: Concrete mix information and use admixtures.
 - 2. Section 03 3923: Membrane Concrete Curing application
 - 3. Section 05 1223:
 - a. Furnishing of pipe for pipe bollards.
 - b. Furnishing of satellite dish mounting pipe.
 - 4. Section 07 9213: Quality of Sealants.
 - 5. Section 10 7516: Furnishing of flagpole base and foundation sleeve.
 - 6. Section 26 5600: Furnishing of light pole base anchors.
 - 7. Section 31 2323: Compaction procedures and tolerances.
 - 8. Section 32 8423: Sleeves for underground irrigation system.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference specified in Section 31 2213.
 - 2. Schedule concrete site element pre-installation conference after installation of sleeves, placing of base, and installation of forms, but before placing of concrete.
 - 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Approved mix design and use of admixtures.
 - b. Installation scheduling, coordination, and placement of concrete.
 - c. Placement, finishing, and curing of concrete including cold and hot weather requirements.

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer's Instructions for detectable warning panels:
 - a. Provide printed product data.
 - b. Installation instructions.
 - c. Cleaning and maintenance instructions.

1.4 REFERENCES

- A. Reference Standards:
1. ASTM International:
 - a. ASTM D 1751-04, 'Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).'

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Materials:
1. Concrete: Meet requirements specified in Section 03 3111 for exterior concrete.

2.2 ACCESSORIES

- A. Formwork: Meet requirements specified in Section 03 1113.
- B. Granular Base:
1. Road Base type gravel or crushed rock, graded by weight as follows:

Sieve	Percent Passing
One Inch	100
3/4 Inch	85 - 100
No. 4	45 - 60
No. 10	30 - 50
No. 200	5 - 10 (non-plastic)

- C. Expansion Joints:
1. 1/2 inch thick.
 2. Manufactured commercial fiber type:
 - a. Meet requirements of ASTM D 1751.
 - b. Type Two Acceptable Products:
 - 1) Conflex by Knight-Celotex, Northfield, IL www.aknightcompany.com.
 - 2) Sealtight by W R Meadows Inc, Hampshire, IL www.wrmeadows.com.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
 3. Recycled Vinyl:
 - a. Light gray color.
 - b. Type Two Acceptable Products:
 - 1) Proflex by Oscoda Plastics Inc, Oscoda, MI www.oscodaplastics.com.
 - 2) Equal as approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Sub-Base: Compact sub-base as specified in Section 31 2213.

3.2 INSTALLATION

- A. General:
1. Form vertical surfaces full depth. Do not allow concrete to flow out from under forms in any degree into landscaped areas.

- B. Granular Base: Except under mow strips, place 4 inches minimum of granular base, level, and compact as specified in Section 31 2213.
- C. Sidewalks and Landings:
 - 1. Slope sidewalks with cross slope of 1/8 to 1/4 inch per ft in direction of intended drainage.
 - 2. Slope sidewalks away from building one percent minimum.
 - 3. Do not dust with cement.
- D. Mow Strips:
 - 1. Granular base not necessary under mow strips.
 - 2. Form and cast mow strips in place.
 - 3. Set top of mow strip 1-1/2 inches above finish grade.
 - 4. Compact topsoil underneath mow strip to density of undisturbed earth.
- E. Light Pole Bases: Install bond breaker consisting of three layers of 30 lb roofing felt between pole base and adjoining sidewalk.
- F. Satellite Dish Base:
 - 1. Install bond breaker consisting of three layers of 30 lb roofing felt between pole base and adjoining slab.
 - 2. Install base pipe plumb.
- G. Pipe Bollards: Install plumb and fill with concrete.

H. Joints:

- 1. Align joints of sidewalk and curb and gutter.
- 2. Expansion And Contraction Joints:
 - a. Install so top of expansion joint material is 1/4 inch below finished surface of concrete.
 - b. No expansion joint required between curbs and walks parallel to curb.
 - c. Provide expansion joint at end of walks perpendicular to and terminating at curb or other concrete elements.
 - d. Spacing On Center:

Sidewalks and Curbs	50 feet
Mow Strips	100 feet
Flat Drainage Structures	50 feet
Retaining Walls w/guardrails	36 feet
Retaining Walls w/chain link fencing	50 feet

- 3. Scored Control Joints:
 - a. Depth of control joints shall be approximately one quarter of concrete slab thickness, but not less than one inch.
 - b. Spacing On Center:

Sidewalks	5 feet	
Curbs	10 feet	
Mow Strips	5 feet	
Flat Drainage Structures	10 feet	
Retaining Walls w/guardrails	Align with posts	
Retaining Walls w/chain link fencing	Align with posts	

I. Finish:

- 1. Flatwork:
 - a. Curb, Gutter, Sidewalks, Mow Strips, Flat Drainage Structures, Stairs, And Miscellaneous:
 - 1) Broom finish.
 - 2) Round edges including edges formed by expansion joints.
 - 3) Remove edger marks.
- 2. Vertical Surfaces:
 - a. Retaining Walls, Exposed Foundations, etc:
 - 1) Finish provided by form release / finish agent specified in 03 1113.
 - 2) Repair of Unacceptable Concrete.

- a) Immediately after removing forms, remove joints, marks, bellies, projections, loose materials, and cut back metal ties from surfaces to be exposed.
- b) Point up voids with cement mortar, 1:2 mix, and rub exposed surface with carborundum to smooth, even surface matching surrounding undamaged area.
- c) Light Pole Bases: Exposed portion to have rubbed finish.

3.3 APPLICATION

A. Interface With Other Work:

1. Membrane Curing Compound: Apply product specified in Section 03 3923 to curbs, gutters, sidewalks, flat drainage structures, stairs, landings, and pads.

3.4 FIELD QUALITY CONTROL

- #### **A. Inspection:** To allow Architect's verification of grades and elevations, notify Architect three days minimum before placing concrete for specified concrete site elements.

END OF SECTION

SECTION 03 3111**NORMAL WEIGHT STRUCTURAL CONCRETE****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Furnish and install Project concrete work as described in Contract Documents.
2. Quality of concrete used on Project but furnished under other Sections.

B. Products Installed But Not Furnished Under This Section:

1. Inserts, bolts, boxes, templates, and fastening devices for other work, including those for bases only for Mechanical and Electrical.
2. Concrete accessories.

C. Related Requirements:

1. Divisions 22, 23, And 26: Mechanical and electrical devices including boxes, conduits, pipes, hangers, inserts, and other work to be embedded in concrete work before placing.
2. Section 31 2324: Granular base course under slabs.
3. Section 32 1313: Concrete paving.
4. Furnishing of items to be embedded in concrete specified in Section involved.
5. Owner will provide concrete leveling compounds and patching compounds required for carpet installation.

1.2 REFERENCES

A. Reference Standards:

1. ASTM International:
 - a. ASTM C 33-03, 'Standard Specification for Concrete Aggregates.'
 - b. ASTM C 94-05, 'Standard Specification for Ready-Mixed Concrete.'
 - c. ASTM C 150-05, 'Standard Specification for Portland Cement.'
 - d. ASTM C 260-01, 'Standard Specification for Air-Entraining Admixtures for Concrete.'
 - e. ASTM C 494-05a, 'Standard Specification for Chemical Admixtures for Concrete.'
 - f. ASTM C 595-08, 'Standard Specification for Blended Hydraulic Cements.'
 - g. ASTM C 618-05, 'Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.'
 - h. ASTM C 989, 'Standard Specification for Ground Granulated Blast – Furnace Slag for use in Concrete and Mortars.'
 - i. ASTM C 1116, 'Standard Specification for Fiber Reinforced Concrete and Shotcrete.'
 - j. ASTM E 1155-96 (2001), 'Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.'
 - k. ASTM C 1157-08, 'Standard Performance Specification for Hydraulic Cement.'

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:

1. Schedule pre-installation conference prior to placing of footings, installation of foundation forms and reinforcing steel, and installation of anchors, dowels, inserts, and block outs in foundation walls and slabs.
2. In addition to agenda items specified in Section 01 3100, review following:
 - a. Approved mix design and use of admixtures.
 - b. Installation scheduling, coordination, and placement of items installed in and under floor slab.

- c. Placement, finishing, and curing of concrete including cold and hot weather requirements.
- d. Concrete slab tolerances and corrective measures if tolerances not met.
- 3. Require the ready mix supplier to work with the HVSMF supplier regarding mix designs and batching procedures and with the pumping subcontractor if the mix is pumped.
 - a. The flat work subcontractor (placing and finishing), the pumper subcontractor, the superintendant are to be at the Pre-Installation Conference to discuss the concrete mix design, the placing of the concrete, the finishing of the concrete and the curing of the concrete.
 - b. Review Special Procedure Submittal.

1.4 SUBMITTALS

A. Action Submittals:

- 1. Shop Drawings: Show dimensioned locations of anchor bolts for hold-down anchors and columns.

B. Informational Submittals:

- 1. Certificates:
 - a. Require mix plant to furnish delivery ticket for each batch of concrete. Keep delivery tickets at job-site for use of Owner or his representatives. Tickets shall show following:
 - 1) Name of ready-mix batch plant.
 - 2) Serial number of ticket.
 - 3) Date and truck number.
 - 4) Name of Contractor.
 - 5) Name and location of Project.
 - 6) Specific class or designation of concrete conforming to that used in Contract Documents.
 - 7) Amount of concrete.
 - 8) Time loaded.
 - 9) Type, name, manufacturer, and amount of admixtures used.
 - 10) Amount and type of cement.
 - 11) Total water content.
 - 12) Sizes and weights of sand and aggregate.
- 2. Design Data:
 - a. Submit mix designs to meet following requirements:
 - 1) Proportions:
 - a) Mix Type A:
 - (1) 3000 psi (minimum) at 28 days.
 - (2) Water / Cement Ratio: 0.47 to 0.53 by weight.
 - b) Mix Type D:
 - (1) 4500 psi (minimum) at 28 days.
 - (2) Water / Cement Ratio: 0.45 maximum by weight.
 - c) Mix Type E:
 - (1) 3000 psi (minimum) at 28 days.
 - (2) Water / Cement Ratio: 0.47 to 0.53 maximum by weight.
 - (3) Cementitious material per cubic yard of concrete: 540 lbs.
 - (4) 7 1/2 lbs of Forta Ferro (2 1/4 inches) per cubic yard of concrete.
 - (5) Use low dose of polycarboxylate superplasticizer admixture of about 22 ounces per cubic yard of concrete (4 ounces per 100 pounds of cement).
 - d) Air Entrainment: 6 percent, plus or minus 1-1/2 percent for Exterior Concrete and foundation walls exposed to freeze thaw conditions.
 - e) Do not add water any time during mixing cycle above amount required to meet specified water / cement ratio. No reduction in the amount of cementitious material is allowed.
 - 2) Slump:
 - a) 4 inch slump maximum before addition of high range water reducer.
 - b) 8 inch slump maximum with use of high range water reducer.
 - 3) Admixtures:

- a) Mix design shall show proposed admixture, amount, usage instructions, and justification for proposed use. Do not use any admixture without Architect's written approval.
 - b) Mineral: An amount of specified fly ash not to exceed 20 percent of weight of cement may be substituted for cement. If substituted, consider fly ash with cement in determining amount of water necessary to provide specified water / cement ratio.
 - c) Chemical: Specified accelerator or retarder may be used if necessary to meet environmental conditions.
3. Special Procedure:
- a. High Volume Synthetic Macro Fiber Reinforcement:
 - 1) Construction guidelines by Manufacturer.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:

1. Manufacturer Contact List:
 - a. BASF Admixtures, Cleveland, OH www.basf-admixtures.com.
 - b. Bonsal American, Charlotte, NC www.bonsal.com.
 - c. Dayton Superior Specialty Chemicals, Kansas City, KS www.daytonsuperiorchemical.com.
 - d. Euclid Chemical Company, Cleveland, OH www.euclidchemical.com.
 - e. Fritz-Pak Concrete Admixtures, Dallas, TX www.fritzpak.com.
 - f. Grace Construction Products, Cambridge, MA www.graceconstruction.com and Grace Canada Inc, Ajax, ON (905) 683-8561.
 - g. L & M Construction Chemicals, Omaha, NE www.lmcc.com.
 - h. Larsen Weldcrete by Larsen Products Corp, Rockville, MD www.larsenproducts.com.
 - i. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com and Sika Canada, Pointe Claire, QC www.sika.ca.
 - j. Sonneborn / BASF Building Systems, Shakopee, MN www.chemrex.com.
 - k. TAMMS Industries, Mentor, OH www.tamms.com.
 - l. Unitex, Kansas City, MO www.unitex-chemicals.com.
 - m. U S Mix Products Co, Denver, CO www.usspec.com.
 - n. W R Meadows, Hampshire, IL www.wrmeadows.com.

B. Performance:

1. Design Criteria: Conform to requirements of ASTM C 94 unless specified otherwise.
2. Capacities:
 - a. For testing purposes, following concrete strengths are required:
 - 1) At 7 days: 60 percent minimum of 28 day strengths.
 - 2) At 28 days: 100 percent minimum of 28 day strengths.

C. Materials:

1. Hydraulic Cement: Meet requirements of ASTM C 150, Type I.
2. Aggregates:
 - a. Coarse:
 - 1) Meet requirements of ASTM C 33 or nonconforming aggregate that by test or actual service produces concrete of required strength and conforms to local governing codes.
 - 2) Aggregate shall be uniformly graded by weight as follows:
 - a) Flat Work, Size No. 67.

Sieve	Percent Passing
One Inch	100
3/4 Inch	90 - 100
3/8 Inch	20 - 55
No. 4	0 - 10

No. 8	0 - 5
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b) All Other, Size No. 57.

Sieve	Percent Passing
1-1/2 Inch	100
One Inch	95 - 100
1/2 Inch	25 - 60
No. 4	0 - 10
No. 8	0 - 5

b. Fine:

- 1) Meet requirements of ASTM C 33.
- 2) Aggregate shall be uniformly graded by weight as follows:

Sieve	Percent Passing
3/8 Inch	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	50 - 85
No. 30	25 - 60
No. 50	10 - 30
No. 100	2 - 10

3. Water: Clear, apparently clean, and potable.

4. Admixtures And Miscellaneous:

a. Mineral:

- 1) Fly Ash Pozzolan: Meet requirements of ASTM C 618, Class F or C and with loss on ignition (LOI) of 3 percent maximum.

b. Chemical:

- 1) No admixture shall contain calcium chloride nor shall calcium chloride be used as an admixture. All chemical admixtures used shall be from same manufacturer and compatible with each other.
- 2) Air Entraining Admixture:
 - a) Meet requirements of ASTM C 260.
 - b) Type Two Acceptable Products:
 - c) MB-VR, MB-AE or Micro Air by BASF.
 - d) Air Mix 200 or AEA-92 by Euclid.
 - e) Air plus or Super Air Plus by Fritz-Pak.
 - f) Sika Air by Sika.
 - g) Daravair or Darex II AEA by W R Grace.
 - h) Equal as approved by Architect before use. See Section 01 6200.
- 3) Water Reducing Admixture:
 - a) Meet requirements of C 494, Type A and containing not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - c) Pozzolith Series by BASF.
 - d) Eucon WR 75 or Eucon 91 by Euclid.
 - e) FR-2 or FR-3 by Fritz-Pak.
 - f) Plastocrete 160 by Sika.
 - g) Daracem 50/55, WRDA-64, or WRDA-82 by W R Grace.
 - h) Equal as approved by Architect before use. See Section 01 6200.
- 4) Water Reducing, Retarding Admixture:
 - a) Meet requirements of ASTM C 494, Type D and contain not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - c) Pozzolith Series by BASF.
 - d) Eucon Retarder 75 by Euclid.
 - e) FR-1 or Modified FR-1 by Fritz-Pak.
 - f) Plastiment by Sika.
 - g) Daratard-17 or Daratard-40 by W R Grace.
 - h) Equal as approved by Architect before use. See Section 01 6200.
- 5) High Range Water Reducing Admixture (Superplasticizer):

- a) Meet requirements of ASTM C 494, Type F or G and containing not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - c) Rheobuild 1000 or Glenium Series by BASF.
 - d) Eucon 37 or Eucon 537 by Euclid.
 - e) Supercizer 1 through 7 by Fritz-Pak.
 - f) Sikament 300 by Sika.
 - g) Darachem-100 or WRDA-19 by W R Grace.
 - h) Equal as approved by Architect before use. See Section 01 6200.
- 6) Non-Chloride, Non-Corrosive Accelerating Admixture:
- a) Meet requirements of ASTM C 494, Type C or E and containing not more than 0.05 percent chloride ions.
 - b) Type Two Acceptable Products:
 - c) Accelguard 80 by Euclid.
 - d) Pozzolith NC 534 or 122HE or Pozzutec 20+
 - e) Daraset or Polarset by W R Grace.
 - f) Equal as approved by Architect before use. See Section 01 6200.

2.2 ACCESSORIES

A. Evaporation Retardant:

1. Type Two Acceptable Products:
 - a. Confilm by BASF.
 - b. Sure Film J-74 by Dayton Superior.
 - c. Euco-Bar By Euclid Chemical Co.
 - d. E-Con by L & M Construction Chemicals.
 - e. Pro Film by Unitex.
 - f. U S Spec Monofilm ER by U S Mix Products.
 - g. Equal as approved by Architect before use. See Section 01 6200.

B. Bonding Agents:

1. Type Two Acceptable Products:
 - a. Acrylic Additive by Bonsal American.
 - b. Day Chem Ad Bond (J-40) by Dayton Superior.
 - c. Flex-Con by Euclid Chemical Co.
 - d. Larsen Weldcrete by Larsen Products Corp.
 - e. Everbond by L & M Construction Chemicals.
 - f. Acryl Set by BASF.
 - g. Sonocrete by Sonneborn.
 - h. Tamms Bond by TAMMS Industries.
 - i. U S Spec Multicoat by U S Mix Products.
 - j. Intralok by W R Meadows.
 - k. Equal as approved by Architect before use. See Section 01 6200.

C. High Volume Synthetic Macro Fiber Reinforcement:

1. Interior concrete flatwork only.
2. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
 - a. Forta Ferro by Forta Corp. Grove City, PA www.fortacorp.com.
 - 1) Contact Information: Dan Biddle (724) 458-5221 (office) or (412) 979-9198 (cell) or dbiddle@fortacorp.com.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Inserts, bolts, boxes, templates, pipes, conduits, and other accessories required by Divisions 22, 23, and 26 shall be installed and inspected before placing concrete.
- B. Install inserts, bolts, boxes, templates, pipes, conduits, and other accessories furnished under other Sections to be installed as part of work of this Section. Tie anchor bolts for hold-down anchors and columns securely to reinforcing steel.
- C. Remove water and debris from space to be placed.

3.2 INSTALLATION

A. Special Techniques:

1. Cold Weather Concreting Procedures:

a. General Requirements:

- 1) Materials and equipment required for heating and protection of concrete shall be approved and available at Project site before beginning cold weather concreting.
- 2) Forms, reinforcement, metallic embedments, and fillers shall be free from snow, ice, and frost. Surfaces that will be in contact with newly placed concrete, including sub-grade materials, shall be **35 deg F** minimum at time of concrete placement.
- 3) Thaw sub-grade **6 inches** deep minimum before beginning concrete placement. If necessary, re-compact thawed material.
- 4) Use no frozen materials or materials containing ice.

b. Requirements When Average 24 Hour Temperature, midnight to midnight, Is Below **40 deg F**:

- 1) Temperature of concrete as placed and maintained shall be **55 deg F** minimum and **75 deg F** maximum.
- 2) Heat concrete for 72 hours minimum after placing if regular cement is used; for 48 hours if high early strength cement is used; or longer if determined necessary by Architect. During this period, maintain concrete surface temperature between **55 and 75 deg F**.
- 3) Vent flue gases from combustion heating units to outside of enclosure to prevent carbonation of the concrete surface.
- 4) Prevent concrete from drying during heating period. Maintain housing, insulation, covering, and other protection 24 hours after heat is discontinued.
- 5) After heating period, if temperature falls below **32 deg F**, protect concrete from freezing until strength of **2000 psi** minimum is achieved. Protect flatwork exposed to melting snow or rain during day and freezing during night from freezing until strength of **3500 psi** minimum is achieved.

c. Requirements When Average 24 Hour Temperature, midnight to midnight, Is Above **40 deg F**, but when temperature falls below **32 deg F**:

- 1) Protect concrete from freezing for 72 hours after placing, or until a strength of **2000 psi** is achieved, whichever is longer. Protect flatwork exposed to melting snow or rain during day and freezing during night from freezing until strength of **3500 psi** minimum is achieved.

d. Protect soil supporting concrete footings from freezing under any circumstances.

2. Hot Weather Concreting Procedures:

- a. Maximum concrete temperature allowed is **90 deg F** in hot weather.
- b. Cool aggregate and subgrades by sprinkling.
- c. Avoid cement over **140 deg F**.
- d. Use cold mixing water or ice.
- e. Use fog spray or evaporation retardant to lessen rapid evaporation from concrete surface.

B. Tolerances:

1. Tolerances shall conform to requirements of ACI 117, except where specified differently.
2. Local Flatness / Levelness of Interior Slabs:
 - a. Specified Overall Value of F_F28 / F_L20 and Minimum Local Value of F_F20 / F_L15 when tested in accordance with ASTM E 1155.
 - b. Table Four: Maximum Variation Tolerances.

Thickness, standard	plus 3/8 inch, minus 1/4 inch
Thickness, footings	minus 0 inch
Plan, 0 - 20 feet	1/2 inch
Plan, 40 feet or greater	3/4 inch
Plan, footings	plus 1/2 inch
Eccentricity, footings	2 inch max standard, 1/2 inch at masonry
Openings, size	minus 1/4 inch, plus One inch
Openings, location	plus / minus 1/2 inch at center
Plumb	1/2 inch max
Consecutive Steps, treads	1/4 inch
Consecutive Steps, risers	1/8 inch
Flight of Stairs, treads	1/4 inch in total run
Flight of Stairs, risers	1/8 inch in total height

3. Remedy For Out-of-Tolerance Building Slabs:
 - a. Sections of slabs to be covered by carpet, which do not meet specified tolerances but are within 10 percent of specified tolerances, may be corrected by grinding or filling, at Owner's option. Remove and replace sections of slabs measuring outside specified correctable tolerances.
 - b. If floor leveling compounds or concrete patching compounds are required to bring floor into specified tolerances in carpeted areas, they will be provided by Owner in conjunction with carpet installation and back-charged to Contractor.

C. Placing:

1. General:
 - a. Place as soon after mixing as possible. Deposit as nearly as possible in final position. Placing of concrete shall be continuous until a panel or section is complete.
 - b. In order to avoid overloading of forms and ties, observe following rate of filling for various air temperatures:

1) Table Five: Placing Rate.

Temperature	Rate of Fill per Hour
40 deg F	2 feet
50 deg F	3 feet
60 deg F	4 feet
70 deg F	5 feet

- c. Compact concrete in forms by vibrating and other means where required. Thoroughly work in concrete around reinforcing bars.
 - d. Do not embed aluminum in concrete.
 - e. Do not use contaminated, deteriorated, or re-tempered concrete.
 - f. Avoid accumulation of hardened concrete.
2. Footings:
 - a. Bear 12 inches minimum into undisturbed earth or on mechanically compacted engineered fill. Step footings at ratio of 1-1/2 horizontal to One vertical unless detailed otherwise. Exterior wall footing shall bear 18 inches minimum below finish grades.
 - b. Level top of finish footing and leave rough.
 - c. Where joints are required, bulkhead, key horizontally, and dowel with two No. 5 reinforcing bars, 48 inches long.
3. Foundations And Walls: Leave steel projecting where required for floor tie.
4. Exterior Slabs:
 - a. Dusting with cement not permitted.
 - b. For continuous placing and where shown on Drawings, saw cut one inch deep control joints before shrinkage occurs (2 inches at 6 inches slabs).
5. Equipment Bases: Coordinate with appropriate Sections for locations and dimensions.
6. Joints:

- a. Where possible, locate joints under partitions or where joints will cause least disruption to floor coverings.
 - b. Construction Joints: Locate where shown on Drawings to least impair strength of completed structure. Construction joints in foundation walls shall not occur within **6 feet** of corner and be keyed.
7. Bonding Fresh And Hardened Concrete:
- a. Re-tighten forms.
 - b. Roughen surfaces.
 - c. Clean off foreign matter and laitance.
 - d. Wet but do not saturate.
 - e. Slush with neat cement grout or apply bonding agent.
 - f. Proceed with placing new concrete.
8. Anchor Bolts: Place anchor bolts not tied to reinforcing steel immediately following leveling of concrete. Reconsolidate concrete around bolt immediately after placing bolt. Do not disturb bolts during finishing process.
- D. Finishing:
1. Rubbed Finish, Exposed Vertical Surfaces:
 - a. Immediately after removing forms, remove joints, marks, bellies, projections, loose materials, and cut back metal ties from surfaces to be exposed.
 - b. Point up voids with cement mortar, 1:2 mix, and rub exposed surface with carborundum to smooth, even surface.
 2. Steel Trowel Finishes, Interior Flatwork:
 - a. Float and steel trowel interior slabs after concrete has set enough to avoid bringing water and fines to surface.
 - b. If power troweling is used, get approval of finish from Architect.
 3. Broom Finishes, Exterior Flatwork Not Specified in Section 03 3053:
 - a. Broom finish exterior slabs.
 - b. Round edges including edges formed by expansion joints.
 - c. Remove edger marks.
 4. Rough: Top of slabs to receive setting bed for ceramic or paver tile.
- E. Curing:
1. Interior Slabs:
 - a. Water cure as specified in Section 03 3913.
 2. Concrete Paving: Membrane cure as specified in Section 03 3923.
 3. All Other Concrete Flatwork And Curbs: Membrane cure as specified in Section 03 3923.

3.3 FIELD QUALITY CONTROL

- A. Inspection: Notify Architect three days minimum before placing concrete for footings, foundation walls, and building slabs.
- B. Owner shall employ testing agency for quality control of concrete.

3.4 PROTECTION

- A. Protect concrete that has not received its initial set from precipitation to avoid excess water in mix and unsatisfactory surface finish.
- B. Do not allow materials resulting from construction activities, which will affect concrete or application of finish floor systems adversely, to come in contact with interior concrete slabs.

END OF SECTION

SECTION 03 3923
MEMBRANE CONCRETE CURING

PART 1 - GENERAL**1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Quality of membrane concrete curing as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 03 3053: Miscellaneous Cast-In-Place Concrete.
 - 2. Section 03 3111: Normal weight structural concrete.
 - 3. Section 32 1313: Concrete paving.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C 309-06, 'Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.'

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data: Manufacturer's product data.
- B. Informational Submittals:
 - 1. Manufacturer Instructions: Printed installation instructions.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Exterior:
 - 1. Low VOC (less than 350 grams per liter), water-borne, membrane forming curing compound meeting requirements of ASTM C 309, Type 2.
 - 2. Horizontal Miscellaneous Cast-In-Place Concrete:
 - a. Class Two Quality Standard. See Section 01 6200 for definition of Classes.
 - 1) Vocomp 20 Cure and Seal by W. R. Meadows.
 - 3. Concrete Paving:
 - a. Class Two Quality Standard. See Section 01 6200 for definition of Classes.
 - 1) 1200 White by W. R. Meadows.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Protection of In-Place Conditions: Protect surfaces that will be receiving products or systems incompatible with curing compounds. Where such surfaces do receive curing compound, remove to extent required by installer of products and systems to be subsequently installed and at no additional cost to Owner.

END OF SECTION

SECTION 06 1100**WOOD FRAMING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install wood framing and blocking as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
 - 1. Miscellaneous structural steel elements.
 - 2. Wood trusses.
 - 3. Glue-laminated structural units.
 - 4. Structural composite lumber.
 - 5. Wood 'I' joists.
- C. Related Requirements:
 - 1. Section 05 1223: Furnishing of miscellaneous structural steel.
 - 2. Section 06 0573: Quality of Preservative Wood Treatment.
 - 3. Section 06 1712: Furnishing of structural composite lumber.
 - 4. Section 06 1733: Furnishing of wood 'I' joists.
 - 5. Section 06 1753: Furnishing of wood trusses.
 - 6. Section 06 1800: Furnishing of glue-laminated structural units.
 - 7. Section 06 4313: Wood stair treads and risers.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Institute of Standards and Technology (NIST), Technology Administration, U. S. Department of Commerce:
 - a. Voluntary Product Standard DOC PS 20-05, 'American Softwood Lumber Standard.'

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Schedule pre-installation conference immediately before beginning framing work.
 - 2. Review items such as:
 - a. Equipment and gypsum board blocking in wood framed walls.
 - b. Operable partition headers.
 - c. Rough opening requirements
 - d. Shear walls and struts.
 - e. Nails and nailing requirements.
 - f. Truss installation.
 - g. Connections.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Test And Evaluation Reports: Technical and engineering data on nails to be set by nailing guns for Architect's approval of types proposed to be used as equivalents to specified hand set nails

and adjusted number and spacing of pneumatically-driven nails to provide equivalent connection capacity.

2. Manufacturer Instructions: Copies of pamphlets specified in REFERENCE Article. After Architect's examination, keep pamphlets on Project site with approved shop drawings. Pamphlets may be obtained from Truss Plate Institute, Wood Truss Council of America, or from Truss Fabricator.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:

1. Protect lumber and plywood and keep under cover in transit and at job site.
2. Do not deliver material unduly long before it is required.

B. Storage And Handling Requirements:

1. Store lumber and plywood on level racks and keep free of ground to avoid warping. Stack to insure proper ventilation and drainage.
2. Handle and store wood trusses in accordance with ANSI / WTCA Booklet BSCI except trusses may be unloaded by dumping if trusses are shipped horizontally, are rolled off low profile roller bed trailer, and no part of any truss is required to drop more than **18 inches** 450 mm.

PART 2 - PRODUCTS

2.1 SUPPLIERS

A. Suppliers:

1. VMR Suppliers. See Section 01 4301.
 - a. J. M. Thomas Forest Products, Ogden, UT. www.thomasforest.com. Contact Tom Karren:
 - 1) Office: (800) 962-8780.
 - 2) FAX: 801-782-9652.
 - 3) E-Mail: tom@thomasforest.com.
 - b. Matheus Lumber, Inc. Vancouver, WA. www.matheuslumber.com. Contact Larry Tommerup:
 - 1) Office: (360) 693-1702, (866) 693-0003.
 - 2) Cell: (360) 921-1036.
 - 3) FAX: (360) 693-1884.
 - 4) E-Mail: larry@matheuslumber.com.
 - c. Shelter Products, Inc., Portland, OR www.shelter-products.com. Contact David M. Routt:
 - 1) Office: (800) 881-3628.
 - 2) Cell: (503) 807-5153.
 - 3) FAX: (503) 238-2663.
 - 4) E-Mail: droutt@shelter-products.com.
 - d. Stock Building Supply, Roy, UT. www.stockbuildingsupply.com. Contact Craig Rees:
 - 1) Office: (801) 436-2203.
 - 2) Mobile: (801) 301-0326.
 - 3) FAX: 801-436-2282.
 - 4) E-Mail: craig.rees@stocksupply.com.

2.2 MATERIALS

A. Dimension Lumber:

1. Meet requirements of PS 20 and National Grading Rules for softwood dimension lumber.
2. Bear grade stamp of WWPA, SPIB, or other association recognized by American Lumber Standards Committee identifying species of lumber by grade mark or by Certificate of Inspection.
3. Lumber **2 inches** or less in nominal thickness shall not exceed 19 percent in moisture content at time of fabrication and installation and be stamped 'S-DRY', 'K-D', or 'MC15.'

4. Lumber shall be S4S.
5. Preservative Treated Plates / Sills:
 - a. **2x4**: Standard and better Douglas Fir, Southern Pine, or HemFir, or StrandGuard by iLevel by Weyerhaeuser Boise, ID www.ilevel.com. (LSL 1.3 E)
 - b. **2x6** And Wider: No. 2 or or MSR 1650f - 1.5e Douglas Fir, Southern Pine, HemFir, or StrandGuard by iLevel by Weyerhaeuser, Boise, ID www.ilevel.com. (LSL 1.3 E).
- B. Posts, Beams, And Timbers **5 Inches by 5 Inches** And Larger: No. 1 or better Douglas Fir or Southern Pine.
- C. Lumber Ledgers: No. 2 Douglas Fir-Larch, or Southern Pine.
- D. See drawings for additional requirements.

2.3 ACCESSORIES

- A. Folding Partition Headers: New, unused plywood conforming to plywood specification requirements of Section 06 1636.
- B. Blocking: Sound lumber without splits, warps, wane, loose knots, or knots larger than **1/2 inch**.
- C. Furring Strips: Utility or better.
- D. Sill Sealer: Closed-cell polyethylene foam, **1/4 inch** thick by width of plate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Use preservative treated wood for wood members in contact with concrete or masonry, including wall, sill, and ledger plates, door and window subframes and bucks, etc.
- B. Interface With Other Work:
 1. Coordinate with other Sections for location of blocking required for installation of equipment and building specialties. Do not allow installation of gypsum board until required blocking is in place.
 2. Where manufactured items are to be installed in framing, provide rough openings of dimensions within tolerances required by manufacturers of such items. Confirm dimensions where not shown on Drawings.
- C. Tolerances:
 1. Walls:
 - a. **1/4 inch** in **20 feet**, non-cumulative in length of wall.
 - b. **1/8 inch** in **10 feet** with **1/4 inch** maximum in height of wall.
 - c. Distances between parallel walls shall be **1/4 inch** maximum along length and height of wall.
- D. Floors:
 1. Place with crown side up.
 2. Provide accurately fitted header and trimmer joists of same size as regular joists around floor openings, unless detailed otherwise, and support by steel joist hangers.
 3. Double joists under partitions that parallel run of joists.
- E. Walls:
 1. Openings: Single, bearing stud supporting header and one adjacent (king) stud continuous between top and bottom plates, unless shown otherwise.
 2. Corners And Partition Intersections: Triple studs.

3. Top Plates In Bearing Partitions: Doubled or tripled and lapped. Stagger joints at least **48 inches**.
 4. Ends Of Stud Wall To Masonry: Use one of the following methods.
 - a. Connect with **1/2 inch** machine bolts **6 inches** from top, **6 inches** from bottom, and **48 inches** maximum on center. Use three bolts minimum in height of **6 foot** or higher wall.
 - b. Secure wood to masonry using continuous **1/4 inch** minimum bead of construction adhesive and powder actuated fasteners installed at **32 inches** on center minimum.
 5. Firestops:
 - a. Horizontal or vertical concealed spaces in walls, light coves, soffits, drop ceilings, and other features over **10 feet** in length or height, and at stairs, ceiling levels, floor levels, and other junctures of horizontal to vertical concealed spaces.
 - b. Within concealed spaces of exterior wall finishes and exterior architectural elements, such as trims, cornices or projections, at maximum intervals of **20 feet**, length or height.
 6. Sill Plates:
 - a. Shear Walls And Bearing Walls:
 - 1) Provide specified anchor **12 inches** maximum and **4 inches** minimum from each end of each plate.
 - 2) Shear Walls: Fasten with anchor bolts embedded in concrete or with screw anchors.
 - 3) Bearing Walls: Fasten with anchor bolts embedded in concrete, or with screw anchors or expansion bolts in drilled holes.
 - b. Non-Structural Walls: Fasten with powder actuated fasteners.
 - c. In addition to requirements of paragraphs 'a' and 'b' above, set sill plates of interior walls measuring less than **36 inches** in length in solid bed of specified construction adhesive, except where sill sealer is used.
 - d. Install specified seal sealer under sill plates of exterior walls of main building and of acoustically insulated interior walls.
 - e. Masonry Wall Plates:
 - 1) Anchor 2x6 and 2x8 wall plates to top of block walls with **5/8 inch** diameter anchor bolts at **32 inches** on center unless noted otherwise.
 - 2) Set plates on masonry bearing walls true and level to provide full bearing. Use mortar as specified in Division 04 for leveling if leveling is required.
 7. Posts And Columns: Unless shown otherwise, nail members of multiple member columns together with 16d at **6 inches** on center from each side.
 8. Beams And Girders:
 - a. Built-Up Members:
 - 1) Stagger individual members of multiple span beams and girders so, over any one support, no more than half the members will have a joint. In all cases, however, joints shall occur over supports.
 - 2) Unless shown otherwise on Drawings, nail two-ply built-up members with 10d nails **12 inches** on center top and bottom, staggered on opposite sides. Nail three-ply built-up members with 16d nails at **12 inches** on center, top and bottom, staggered, on opposite sides. Set with crown edge up with full bearing at ends and intermediate supports.
 - b. Pre-Fabricated Members:
 - 1) Solid glu-lam, LVL, LSL, or PSL members may be used in place of built-up **2x** framing members. Size shall be same as built-up member.
 - 2) Solid LVL or PSL members may be used in place of built-up LVL members. Size shall be same as sum of built-up members.
 - c. Wood shims are not acceptable under ends.
 - d. Do not notch framing members unless specifically shown in Drawing detail.
 9. Nailing:
 - a. Top plates: Spiked together, 16d, **16 inches** on center.
 - b. Top plates: Laps, lap members **48 inches** minimum and nail with 16d nails **4 inches** on center
 - c. Top plates: Intersections, three 16d.
 - d. Backing And Blocking: Three 8d, each end.
 - e. Corner studs and angles: 16d, **16 inches** on center.
- F. Roof And Ceiling Framing:
1. Place with crown side up at **16 inches** on center unless noted otherwise.
 2. Install structural blocking and bridging as necessary and as described in Contract Documents.

3. Special Requirements:
 - a. Roof And Ceiling Joists: Lap joists **4 inches** minimum and secure with code approved framing anchors.
 - b. Roof Rafters And Outlookers:
 - 1) Cut level at wall plate and provide at least **2-1/2 inches** bearing where applicable. Spike securely to plate with three 10d nails.
 - 2) Attach to trusses or other end supports with framing anchors described in Contract Documents.
 - 3) Provide for bracing at bearing partitions.
4. Installation of Wood Trusses:
 - a. Handle, erect, and brace wood trusses in accordance with TPI / WTCA Booklet BCSI.
 - b. Do not install damaged or broken wood trusses. Replace wood trusses that are broken, damaged, or have had members cut out during course of construction.
 - c. Provide construction bracing for trusses in accordance with TPI DSB-89.
 - d. Provide continuous 2x4 horizontal web bracing as shown on truss shop drawings.
 - 1) Secure bracing to each truss with two 10d or 16d nails.
 - 2) Lap splice bracing by placing bracing members side by side on common web member. Butt splices are not acceptable.
 - e. Unless directed or shown otherwise, provide diagonal 2x4 bracing between trusses at each line of horizontal web bracing.
 - 1) This diagonal bracing shall be continuous and extend from junction of web and top chord of one truss to junction of web and bottom chord of different truss.
 - 2) Install bracing at approximately 45 degree angle. Bracing will extend over three trusses minimum or more as determined by height of trusses and 45 degree installation angle.
 - 3) Install brace on side of web opposite horizontal web bracing and nail to each web with two 10d or 16d nails.
 - 4) Install one brace every 20 feet as measured from top of brace to top of next brace.
5. Installation of Glue-Laminated Structural Units:
 - a. Install work in accordance with Fabricators instructions and Glue-Lam Erection Safety Practices.
 - b. Adequately support and brace work until tied into building structure to insure against collapse due to wind or other forces.
 - c. Maintain protection of beams until roofing has been installed.
6. Installation of Structural Composite Lumber:
 - a. Install temporary horizontal and cross bracing to hold members plumb and in safe condition until permanent bracing is installed.
 - b. Install permanent bracing and related components before application of loads to members.
7. Installation of wood Web Joists:
 - a. Handle, erect, and brace plywood web joists in accordance with Manufacturer's instructions.
 - b. Do not install damaged or broken wood web joists.
 - c. Install temporary horizontal and cross bracing to hold members plumb and in safe condition until permanent bracing is installed.
 - d. Cut holes through webs at locations or of sizes shown on Drawings and as recommended by Manufacturer.
- G. Folding Partition Structural Headers:
 1. Provide for double or single track as required by Folding Partition Manufacturer.
 2. Stagger joints in plywood.
 3. Glue plywood layers together with continuous bead **2 inches** in from each edge and every **4 inches** on center between. In addition, Screw layers together with **1-1/4 inch** screws **one inch** in from each edge and **12 inches** on center for length of header.
 4. Secure headers and header backing to structure as described in Contract Documents.
- H. Accessory / Equipment Mounting And Gypsum Board Back Blocking (nailers):
 1. Furnish and install blocking in wood framing required for hardware, specialties, equipment, accessories, and mechanical and electrical items, etc.
- I. Accessory / Equipment Mounting And Standing & Running Trim Blocking (nailers):
 1. Furnish and install blocking in wood framing required for hardware, specialties, equipment, accessories, and mechanical and electrical items, etc.

2. Attach blocking not installed with clips with two fasteners in each end of each piece of blocking.

J. Furring Strips

1. On Wood or Steel: Nail or screw as required to secure firmly.
2. On Concrete or Masonry:
 - a. Back up furring strips on exterior walls or walls in contact with earth with 15 lb felt strip.
 - b. Nail at **12 inches** on center maximum.

END OF SECTION

SECTION 06 1636**WOOD PANEL PRODUCT SHEATHING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install wood panel product sheathing required for walls, roofs, and floors as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Institute of Standards and Technology (NIST), Technology Administration, U. S. Department of Commerce:
 - a. Voluntary Product Standard DOC PS 1-07. 'Structural Plywood.'
 - b. Voluntary Product Standard DOC PS 2-04, 'Performance Standard for Wood-based Structural-Use Panels.'

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 06 1100.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect sheathing and keep under cover in transit and at job site.
- B. Do not deliver material unduly long before it is required.
- C. Store sheathing on level racks and keep free of ground. Stack to insure proper ventilation and drainage.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Suppliers:
 - 1. VMR Suppliers. See Section 01 4301.
 - a. J. M. Thomas Forest Products, Ogden, UT. www.thomasforest.com. Contact Tom Karren:
 - 1) Office: (800) 962-8780.
 - 2) FAX: 801-782-9652.
 - 3) E-Mail: tom@thomasforest.com.
 - b. Matheus Lumber, Inc. Vancouver, WA. www.matheuslumber.com. Contact Larry Tommerup:
 - 1) Office: (360) 693-1702, (866) 693-0003.
 - 2) Cell: (360) 921-1036.
 - 3) FAX: (360) 693-1884.
 - 4) E-Mail: larry@matheuslumber.com.

- c. Shelter Products, Inc., Portland, OR www.shelter-products.com. Contact David M. Routt:
 - 1) Office: (800) 881-3628.
 - 2) Cell: (503) 807-5153.
 - 3) FAX: (503) 238-2663.
 - 4) E-Mail: droutt@shelter-products.com.
- d. Stock Building Supply, Roy, UT. www.stockbuildingsupply.com. Contact Craig Rees:
 - 1) Office: (801) 436-2203.
 - 2) Mobile: (801) 301-0326.
 - 3) FAX: 801-436-2282.
 - 4) E-Mail: craig.rees@stocksupply.com.

B. Performance:

- 1. Design Criteria:
 - a. Meet requirements of PS 1, PS 2, PRP-108 (APA), or PRP-133 (TECO). Except where plywood is specifically indicated on Drawings, oriented strand board (OSB) is acceptable.
- 2. Sheathing:
 - a. Sheathing shall bear grade stamp from American Plywood Association (APA) or equal grading organization.
 - b. Sheathing shall not exceed 18 percent moisture content when fabricated or more than 19 percent when installed in Project.
 - c. Sheathing **23/32 inch** thick and thicker used for single-layer subflooring shall be tongue and groove.
 - d. Sheathing used for same purpose shall be of same thickness. In all cases, thickness specified is minimum required regardless of span rating.
 - e. Minimum span ratings for given thicknesses shall be as follows:

Thickness	Span Rating
3/8 inch	24 / 0
7/16 inch nominal	24 / 16
15/32 inch actual	32 / 16
1/2 inch nominal	32 / 16
19/32 inch actual	40 / 20
5/8 inch nominal	40 / 20
23/32 inch actual	48 / 24
3/4 inch nominal	48 / 24

2.2 ACCESSORIES

- A. Nails:
 - 1. As indicated on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Top of nail heads shall be flush with sheathing surface.
 - 2. Use of edge clips to provide spacing between sheathing panels is acceptable.
- B. Wall Sheathing:
 - 1. Spacing: Provide **1/8 inch** space between sheets at end and edge joints.
 - 2. Edge Bearing And Blocking:
 - a. Panel edges shall bear on framing members and butt along their center lines.
 - b. Back block panel edges, which do not bear on framing members, with **2 inch nominal** framing.
 - 3. Nail Spacing:
 - a. As indicated on Drawings.

- b. Place nails not less than **3/8 inch** in from edge.
 4. Thickness:
 - a. As indicated on Drawings.
 5. Do not install any piece of wall sheathing with shortest dimension of less than **12 inches**.
- C. Roof Sheathing:
1. Placing:
 - a. Lay face grain at right angles to supports. Provide blocking for support if framing turns at roof overhang.
 - b. Provide **1/8 inch** space between sheets at end and side joints.
 - c. Stagger panel end joints.
 - d. Sheathing shall be continuous of two spans minimum.
 2. Nail Spacing:
 - a. As indicated on Drawings.
 - b. Place nails at least **3/8 inch** in from edge.
 3. Thickness:
 - a. As indicated on Drawings.
 4. Do not install any piece of roof sheathing with shortest dimension of less than **24 inches** unless support is provided under all edges.
- D. Floor Sheathing:
1. Floor Sheathing: 1 Layer Subflooring.
 - a. Apply bead of glue to structural supports. Lay face grain / strength axis across supports and with panel continuous over two supports minimum.
 - b. Allow expansion gap of at least **1/2 inch** at walls.
 - c. Tongue and Groove.
 - d. Nail Spacing.
 - 1) As indicated on Drawings.
 - e. Thickness:
 - 1) As indicated on Drawings.
 - f. Do not install any piece of bottom layer floor sheathing with shortest dimension of less than **24 inches**.
 2. Subflooring: 2 Layers Subflooring.
 - a. Bottom layer:
 - 1) Glue subflooring layers together along lines of structural supports.
 - 2) Leave **1/32 inch** gap at side and end joints.
 - 3) Nail as per floor sheathing nailing requirements.
 - 4) Thickness:
 - a) **19/32 inch actual** minimum thickness, except where specifically noted otherwise.
 - 5) Do not install any piece of single layer floor sheathing with shortest dimension of less than **24 inches**.
 - b. Top layer:
 - 1) Stagger joints of second layer subflooring so they do not line up with joints of first layer subflooring, but do align with intermediate structural member (for example, align with field nailing of bottom subflooring layer).
 - 2) Glue subflooring layers together along lines of structural supports.
 - 3) Leave **1/32 inch** gap at side and end joints.
 - 4) Nail at **6 inch** centers on ends and **12 inch** centers on intermediate structural members.
 - 5) Thickness:
 - a) **19/32 inch actual** minimum thickness, except where specifically noted otherwise.
 - 6) Do not install any piece of single layer floor sheathing with shortest dimension of less than **24 inches**.

3.2 PROTECTION

- A. Protect roof sheathing from moisture until roofing is installed.

END OF SECTION

SECTION 06 1712**STRUCTURAL COMPOSITE LUMBER: SCL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Laminated Veneer Lumber (LVL).
 - 2. Parallel Strand Lumber (PSL).
 - 3. Laminated Strand Lumber (LSL).
- B. Related Requirements:
 - 1. Section 06 1100: Installation.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D2559-04, 'Standard Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions.'
 - b. ASTM D5456-08, 'Standard Specification for Evaluation of Structural Composite Lumber Products.'

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Certificates: Provide certification confirming that material structural design properties and design stresses have met or exceed requirements shown on Drawings.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
 - 1. Store members on job site in accordance with Manufacturer's instructions.
 - 2. Keep dry and provide supports to keep members off floor or ground.
 - 3. Split plastic wrappers of members stored encased in plastic on bottom side to allow for air circulation.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Suppliers:
 - 1. VMR Suppliers. See Section 01 4301.
 - a. J. M. Thomas Forest Products, Ogden, UT. www.thomasforest.com. Contact Tom Karren:
 - 1) Office: (800) 962-8780.
 - 2) FAX: 801-782-9652.
 - 3) E-Mail: tom@thomasforest.com.

- b. Matheus Lumber, Inc. Vancouver, WA. www.matheuslumber.com. Contact Larry Tommerup:
 - 1) Office: (360) 693-1702, (866) 693-0003.
 - 2) Cell: (360) 921-1036.
 - 3) FAX: (360) 693-1884.
 - 4) E-Mail: larry@matheuslumber.com.
 - c. Shelter Products, Inc., Portland, OR www.shelter-products.com. Contact David M. Routt:
 - 1) Office: (800) 881-3628.
 - 2) Cell: (503) 807-5153.
 - 3) FAX: (503) 238-2663.
 - 4) E-Mail: droutt@shelter-products.com.
 - d. Stock Building Supply, Roy, UT. www.stockbuildingsupply.com. Contact Craig Rees:
 - 1) Office: (801) 436-2203.
 - 2) Mobile: (801) 301-0326.
 - 3) FAX: 801-436-2282.
 - 4) E-Mail: craig.rees@stocksupply.com.
- B. Manufacturers:
- 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Boise Cascade Corp, Boise, ID www.bc.com.
 - b. Louisiana Pacific Corp, Portland, OR www.lpcorp.com.
 - c. iLevel by Weyerhaeuser, Boise, ID www.ilevel.com or Surrey, BC (604) .588-7878.
- C. Design Criteria:
- 1. Materials shall be tested and evaluated in accordance with ASTM D5456.
 - 2. Materials shall have current ICC-ES Evaluation Report, report approved by International Codes Council, or report issued by Architect approved model code evaluation service and shall comply with requirements of report.
- D. Materials:
- 1. Members:
 - a. Identify materials by stamp or stamps indicating manufacturer's name, product trade name, grade, species (if applicable), evaluation report number, plant number, and name or logo of independent inspection agency.
 - 2. Adhesive: Meet requirements of ASTM D2559.
- E. Fabrication: Materials shall be manufactured in a plant evaluated for fabrication by governing code evaluation service and under supervision of third party inspection agency listed by governing code evaluation service.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 06 1733**WOOD 'I' JOISTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Plywood web 'I' joists, web stiffeners, and components.
- B. Related Requirements:
 - 1. Section 06 1100: Installing, securing, bracing, etc.

1.2 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Include following information on submitted shop drawings:
 - 1) Stamp and signature of Engineer responsible for preparation of shop drawings.
 - 2) Show critical dimensions for determining fit and placement in building as well as loads joists are designed to support.
 - 3) Flange material and sizes.
 - 4) Size, thickness, and dimension of web.
 - 5) Lumber species and grades used.
 - 6) Web stiffener locations, make-up, and installation
 - 7) Name and trademark of Manufacturer.
- B. Informational Submittals:
 - 1. Design Data: Complete design calculation showing internal layout, member forces, and stress control points for each joist design.
 - 2. Test And Evaluation Reports: Copies of ICBO reports showing approval of connections and webs.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Store joists in vertical position protected from weather.
- B. Handle with care to prevent damage.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Suppliers:
 - 1. VMR Suppliers. See Section 01 4301.
 - a. J. M. Thomas Forest Products, Ogden, UT. www.thomasforest.com. Contact Tom Karren:
 - 1) Office: (800) 962-8780.
 - 2) FAX: 801-782-9652.
 - 3) E-Mail: tom@thomasforest.com.

- b. Matheus Lumber, Inc. Vancouver, WA. www.matheuslumber.com. Contact Larry Tommerup:
 - 1) Office: (360) 693-1702, (866) 693-0003.
 - 2) Cell: (360) 921-1036.
 - 3) FAX: (360) 693-1884.
 - 4) E-Mail: larry@matheuslumber.com.
 - c. Shelter Products, Inc., Portland, OR www.shelter-products.com. Contact David M. Routt:
 - 1) Office: (800) 881-3628.
 - 2) Cell: (503) 807-5153.
 - 3) FAX: (503) 238-2663.
 - 4) E-Mail: droutt@shelter-products.com.
 - d. Stock Building Supply, Roy, UT. www.stockbuildingsupply.com. Contact Craig Rees:
 - 1) Office: (801) 436-2203.
 - 2) Mobile: (801) 301-0326.
 - 3) FAX: 801-436-2282.
 - 4) E-Mail: craig.rees@stocksupply.com.
- B. Manufacturers:
- 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of categories.
 - a. Boise Cascade Corp, Boise, ID www.bc.com.
 - b. Louisiana Pacific Corp, Portland, OR www.lpcorp.com.
 - c. iLevel by Weyerhaeuser, Boise, ID www.ilevel.com or Surrey, BC (604) 588-7878.
- C. Performance:
- 1. Design Criteria:
 - a. Provide joists that meet the load capacity and stiffness requirements shown on Drawings.
 - b. Custom design joists under supervision of registered professional engineer. Designs shall be in accordance with allowable values assigned by building code approval.
 - c. Only connections and webs currently approved by Research Committee of ICBO are acceptable for use.

2.2 FABRICATION

- A. Fabrication of joists shall be as approved by ICBO, except where requirements of Contract Documents exceed ICBO requirements.

PART 3 - EXECUTION: Not Used

END OF SECTION

SECTION 06 1753**SHOP-FABRICATED WOOD TRUSSES: Trussed Rafters****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Supplied But Not Installed Under This Section:
 - 1. Wood roof trusses.
 - 2. Trussed blocking for roof trusses.

- B. Related Requirements:
 - 1. Section 06 1100:
 - a. Storage and handling of trusses on Project site
 - b. Installing, securing, bracing, etc
 - c. Required blocking other than trussed blocking

1.2 REFERENCES

- A. Reference Standards:
 - 1. American National Standards Institute / Truss Plate Institute:
 - a. ANSI / TPI 1-2007, 'National Design Standard for Metal Plate Connected Wood Truss Construction
 - 2. International Standards Organization (ISO) 17020, 'General criteria for the operation of various types of bodies performing inspection.'
 - 3. Truss Plate Institute / Wood Truss Council of America:
 - a. TPI / WTCA Building Component Safety Information BCSI 2008, 'Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses lines.'

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Base shop drawings on truss configurations and on truss loads shown on Drawings and on requirements of Contract Documents. Joint configurations may be modified to allow double cut webs. Determine member forces from exact analysis method as defined by TPI.
 - b. Include following information on submitted shop drawings:
 - 1) Allowable loads in lbs per effective nail or lbs per sq inch for lumber and plates used as allowed by ICBO and current ICBO report number.
 - 2) Stress reduction factors used for plates and lumber.
 - 3) Top and bottom chord design loads in psf.
 - 4) Size, thickness, and exact location by dimension of plates.
 - 5) Lumber species and grades used.
 - 6) Combine stress ratio for each member.
 - 7) Stamp and signature of Engineer responsible for preparation of shop drawings.
 - 8) Name and trademark of Plate Manufacturer if metal plates are used.
 - 9) Name and address of Truss Fabricator and Project name and address.

- B. Informational Submittals:
 - 1. Certificates:
 - a. Provide copy of certification and complete "Truss Plant Certification Requirements Form" to Architect before bid.

2. Test And Evaluation Reports:
 - a. Copies of previous four quarterly inspection reports verifying compliance with TPI regulations.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 1. Truss Fabricator must have a current certification by TPI / WTCA.
 2. Truss Fabricator shall have in place a program requiring fabrication plant to be inspected four times each year by an independent testing laboratory in accordance with TPI regulations.

1.5 DELIVERY, HANDLING, AND STORAGE

- A. Delivery And Acceptance Requirements:
 1. Notify Architect two days minimum before arrival of trusses to allow for scheduling of truss inspection on site before unloading and for monitoring of unloading procedure.
 2. Unload trusses by one of following methods.
 - a. As outlined in TPI / WTCA Booklet BCSI.
 - b. Trusses may be unloaded by dumping if trusses are shipped horizontally, are rolled off low profile roller bed trailer, and if no part of any truss is required to drop more than **18 inches**.
 3. After delivery of trusses:
 - a. Inspect for damage before installing trusses.
 - b. Inspect for "gaps" between framing members.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Performance:
 1. Design Criteria:
 - a. Top And Bottom Chords And Web Members:
 - 1) 2 inch by 4 inch nominal minimum size.
 - 2) Sizes, species, and grades of members shall be as required to provide combined stress ratios of less than one.
 - 3) Designed in accordance with ANSI / TPI-1 for given design loads.
- B. Materials:
 1. Top And Bottom Chords And Web Members: Douglas Fir or Southern Pine No. 2 or better.
 2. Metal Gusset Plates:
 - a. Plates shall be galvanized or otherwise protected from corrosion.
 - b. Manufacturer's name or trademark shall be visible on plates.
 - c. Category Four Approved Manufacturers. See Section 01 6000 for definitions of Categories.
 - 1) Alpine, ITW Building Components Group, Pompano Beach, FL www.aslpeng.com.
 - 2) Alpine Systems Corporation, Concord, ON www.alpinesys.com.
 - 3) CompuTrus Inc, Lake Elsinore, CA www.computrus.com.
 - 4) Jager Metal Products, Calgary, AB www.jagermetalproducts.com.
 - 5) MiTek Industries, Chesterfield, MO www.mii.com.
 - 6) Truswal Systems, Div ITW, Arlington, TX or Truswal Systems of Canada Ltd, Mississauga, ON www.truswal.com.
- C. Fabrication:
 1. General:
 - a. Fabrication of trusses shall be as approved by ICC or ICBO except that this Specification shall govern when it exceeds ICC requirements.
 - b. Fabricate trusses from approved shop drawings.

- c. Fabricate trusses in jigs with members accurately cut to provide good bearing at joints. Joints shall be acceptable if the average opening between ends of members immediately after fabrication is less than **1/16 inch**.
- d. Each chord section shall be involved in two panel points before being spliced.
- 2. Metal Gusset Plates:
 - a. No panel point shall have more than one plate per truss side
 - b. Plates shall have minimum bite of **2-1/2 inches** on members. Measure bite along center line of webs and perpendicular to chord axes. Orient plate axis parallel with truss chord axis except where chords change pitch or terminate. Plates may be placed parallel with webs at single web joints.
 - c. Plate Sizes:
 - 1) Minimum width of plates shall be **3 inches**.
 - 2) Size plates, nail and steel section for 110% of member forces.
 - 3) No increase in plate values will be allowed for duration of loading or other factors.
 - d. Press plates into members to obtain full penetration without crushing outer surface of wood. Plate embedment is acceptable if opening between plate and wood surface is less than **1/32 inch**.
 - e. Lumber defects and plate misplacement, in combination, shall not reduce plate area or number of effective teeth, prongs, or nails by more than ten percent.
 - f. Do not apply metal gusset plates after shop fabrication.

PART 3 - EXECUTION: Not Used

END OF SECTION

ATTACHMENTS

Truss Plant Certification Requirements Form

The General Contractor shall verify that suppliers of wood trusses are certified. The General Contractor is to provide a copy of the certification and these completed "Truss Plant Certification Requirements Form" to the Architect (PA) prior to bid.

Metal Plate Connected (MPC) wood truss operations must design, manufacture and provide quality control and quality audits that comply with the latest edition of ANSI/TPI-1 promulgated by the Truss Plate Institute. The truss plant must be certified by an independent third party accredited Quality Insurance business such as, but not limited to, the Truss Plate Institute (TPI); the Southern Pine Inspection Bureau, the Timber Products Inspection Bureau or the PFS Corp. The third party accredited Quality Insurance business must be under the auspices of the International Accreditation Services (IAS) or the American National Standards Institute (ANSI) and be ISO/IES Standard 17020 compliant. The inspection/audit process is to be completely independent of the truss manufacturer.

The truss plant shall fulfill the following requirements*:

- _____ Have an independent and accredited third party inspection agency (Quality Insurance business) staff member visit the truss plant for the certification. The certification requirements shall meet: The Acceptance Criteria for Quality Documentation (ICC AC-10) by the ICC Evaluation Service, Inc. which shall include the quality control requirements of the Product Standard of ANSI/TPI or shall meet the quality control methodology prescribed by the Wood Truss Council of America (WTCA); the WTCA QC.
- _____ Have at least one inspection done quarterly by an independent third party inspection agency (Quality Insurance business) that is itself certified.
- _____ Do inspections at the required frequency and of the type established by the certification program. As a minimum, three trusses per set up location per shift including the "Tooth Count Method" or the "Plate Placement Method".
- _____ Not manufacture trusses or use components that do not comply with the requirements of this form and of the contract documents.
- _____ Provide proof of compliance to the requirements of this form and provide the proof to the General Contractor who will forward it to the Architect prior to the truss plant providing a bid.

*Also see <http://www.sbcindustry.com> and <http://www.tpinst.org>.

SECTION 06 1800**GLUED-LAMINATED CONSTRUCTION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Glu-lam beams.
- B. Related Requirements:
 - 1. Section 05 1223: Hardware and steel shapes.
 - 2. Section 06 1100: Installation.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Institute of Timber Construction / American National Standards Institute:
 - a. AITC / ANSI A 190.1-2002, 'Wood Products - Structural Glued Laminated Timber.'
 - 2. ASTM International:
 - a. ASTM A36 / A36M-08, 'Standard Specification for Carbon Structural Steel.'

1.3 SUBMITTALS

- A. Informational Submittals:
 - 1. Certificates: Copy of licensing certificate from AITC, APA-EWS, or CITC.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Fabricator: Licensed by American or Canadian Institute of Timber Construction, or American Wood Systems.
- B. Certifications: Each beam shall bear AITC, APA-EWS, or CITC quality mark.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Wrap members separately with heavy water repellent covers. Protect against damage in transit.
- B. Store and handle to insure maintenance of appearance.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Suppliers:
 - 1. VMR Suppliers. See Section 01 4301.
 - a. J. M. Thomas Forest Products, Ogden, UT. www.thomasforest.com. Contact Tom Karren:

- 1) Office: (800) 962-8780.
 - 2) FAX: 801-782-9652.
 - 3) E-Mail: tom@thomasforest.com.
 - b. Matheus Lumber, Inc. Vancouver, WA. www.matheuslumber.com. Contact Larry Tommerup:
 - 1) Office: (360) 693-1702, (866) 693-0003.
 - 2) Cell: (360) 921-1036.
 - 3) FAX: (360) 693-1884.
 - 4) E-Mail: larry@matheuslumber.com.
 - c. Shelter Products, Inc., Portland, OR www.shelter-products.com. Contact David M. Routt:
 - 1) Office: (800) 881-3628.
 - 2) Cell: (503) 807-5153.
 - 3) FAX: (503) 238-2663.
 - 4) E-Mail: droutt@shelter-products.com.
 - d. Stock Building Supply, Roy, UT. www.stockbuildingsupply.com. Contact Craig Rees:
 - 1) Office: (801) 436-2203.
 - 2) Mobile: (801) 301-0326.
 - 3) FAX: 801-436-2282.
 - 4) E-Mail: craig.rees@stocksupply.com.
- B. Materials:
1. Wood
 - a. Use stress grade 24F-1.8E Douglas Fir (24F-V4 DF/DF) or Southern Pine (24F-V3 SP/SP).
 - b. Moisture content: 12 percent maximum for straight, 10 percent maximum for curved.
 - c. Appearance: Industrial.
 - d. Seal beam faces with penetrating sealer. Treat beam ends with wood preservative.
 2. Adhesives: Wet-use type.
 3. Hardware and steel shapes: Meet requirements of ASTM A36.
- C. Fabrication:
1. Fabricate beams in accordance with requirements of ANSI / AITC A 190.1.
 2. Camber beams to radius of 2000 ft unless shown otherwise on Drawings.

PART 3 - EXECUTION: Not Used

END OF SECTION