SECTION 030505 – UNDER-SLAB VAPOR BARRIER

PART 1 – GENERAL

1.1 SUMMARY

A. Products supplied under this section:
   1. Vapor barrier and installation accessories for installation under concrete slabs.

B. Related sections:
   1. Section 03 30 00 Cast-in-Place Concrete
   2. Section 07 27 26 Air Barriers

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E1745-17 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
   2. ASTM E1643-11 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. Technical Reference - American Concrete Institute (ACI):
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
   2. ACI 302.1R-15 Guide to Concrete Floor and Slab Construction.

1.3 SUBMITTALS

A. Quality control/assurance:
   1. Summary of test results per paragraph 9.3 of ASTM E1745.
   2. Manufacturer's samples and literature.
   3. Manufacturer's installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
   4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Vapor barrier shall have all of the following qualities:
   1. Maintain permeance of less than 0.01 Perms [grains/(ft^2 · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
   2. Other performance criteria:
      a. Strength: ASTM E1745 Class A.
      b. Thickness: 15 mils minimum
   3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1

B. Vapor barrier products:
   1. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com.
   2. No substitutions.

2.2 ACCESSORIES

A. Seams:
1. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

B. Sealing Penetrations of Vapor barrier:
1. Stego Mastic by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
2. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

C. Perimeter/edge seal:
1. Stego Crete Claw by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
2. Stego Term Bar by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
3. StegoTack Tape (double-sided sealant tape) by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

D. Penetration Prevention:
1. Beast Foot by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

E. Vapor Barrier-Safe Screed System
1. Beast Screed by Stego Industries, LLC, (877) 464-7834 www.stegoindustries.com.

PART 3 – EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
1. Level and compact base material.

3.2 INSTALLATION

A. Install vapor barrier in accordance ASTM E1643.
1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
[Specifier note: The perimeter seal can be handled several ways. When sealing to the slab,
Crete Claw is the best option. When sealing to a stem wall or wall,
the best option is to use StegoTack Tape or both StegoTack Tape and Stego Term Bar.]
a. Seal vapor barrier to the entire slab perimeter using Stego Crete Claw, per manufacturer's instructions.
OR
b. Seal vapor barrier to the entire perimeter wall or footing/grade beam with double sided StegoTack Tape, or both Stego Term Bar and StegoTack Tape, per manufacturer’s instructions. Ensure the concrete is clean and dry prior to adhering tape.

3. Overlap joints 6 inches and seal with manufacturer's seam tape.
4. Apply seam tape/Crete Claw to a clean and dry vapor barrier.
5. Seal all penetrations (including pipes) per manufacturer's instructions.
6. For interior forming applications, avoid the use of non-permanent stakes driven through vapor barrier. Use blunt-end and/or threaded nail stakes (screed pad posts) and insert them into Beast Foot. Ensure Beast Foot's peel-and-stick adhesive base is fully adhered to the vapor barrier
7. If non-permanent stakes must be driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
8. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.
9. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.
10. For vapor barrier-safe concrete screeding applications, install Beast Screed (vapor barrier-safe screed system) per manufacturer's instructions prior to placing concrete.

END OF SECTION 030505

SECTION 031513 – WATERSTOPS FOR CONCRETE JOINTS

PART 1 - GENERAL

1.01 Provision Includes

A. Embedded waterstop in concrete including contraction, expansion and construction joints creating a continuous diaphragm to prevent the passage of fluid.

B. The use of nonmetallic waterstops for use in concrete joints subjected to chlorinated water, sea water, oils, solvents, acids, salts, fuels and many other aggressive chemicals and fluids.

1.02 References

A. American Society for Testing and Materials (ASTM)

1. ASTM D 395 — Test Methods for Rubber Property – Compression Set.
2. ASTM D 412 — Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers — Tension.
3. ASTM D 471 — Test Method for Rubber Properties – Effects of Chemicals.
4. ASTM D 624 — Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
5. ASTM D 746 — Test Method for Brittleness Temperature of Plastics by Impact.
6. ASTM D 792 — Test Method for Specific Gravity (Gravity Density) and Density of Plastics by Displacement.
7. ASTM D 1171 — Test Method for Ozone Resistance at 500 pphm.
8. ASTM D 2240 — Test Method for Shore Hardness.

B. Federal Specifications

1. COE CEGS-03250 July 1995 Guide Specification for Military Construction.
2. EPA Title 40 CFR Section 265.193.

C. American Concrete Institute

1. ACI 350.2R-04 — Concrete Structures for Containment of Hazardous Wastes.

D. NSF International

1. NSF/ANSI Standard 61Certification for Drinking Water System Components — Health Effects.

E. BuildingGreen, Inc.

1. GreenSpec® — GreenSpec® Directory, 6th Edition.

1.03 Submittal Procedures

A. Chemical Resistant Waterstops

1. Earth Shield TPV Waterstop submittal shall contain the following:
   a. Samples of each size and shape to be used.
   b. Plate drawings of the waterstop profile indicating all dimensions.
   c. Shop drawings of shop made fittings to be provided by the manufacturer or prepared by the contractor.

d. Copy of test results of ASTM D 471 Chemical Resistance showing compliance with Appendix A.
e. Copy of independent certification to NSF/ANSI Standard 61 Certification for Drinking Water System Components — Health Effects.
f. Copy of independent testing to ASTM D 1171 Ozone Resistance to 500 pphm concentration.
g. Manufacturer's Literature, including MSDS sheets, installation instructions and splicing instructions.
h. Certificate of compliance to physical properties outlined in this specification.

2. Non-metallic Waterstop and Splices — Specimens identified to indicate manufacturer, type of material, size, quantity of material, and shipment or lot represented. Each sample shall be a piece not less than 6 inches long of each type, size, and lot furnished. One splice sample of each size and type for every 50 splices made in the shop and every 10 splices made at the job site. The splice samples shall be made using straight run pieces with the splice located at the mid-length of the sample and finished as required for the installed waterstop. The total length of each splice shall be not less than 12 inches long.

1.04 Delivery and Storage

A. Material delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants.

PART 2 - PRODUCTS

2.01 Waterstops

A. Intersection and change of direction waterstops shall be shop fabricated.

B. Manufacturer:

1. JP Specialties, Inc.
2. Hohmann & Bernard, Inc.
3. Henry
4. Or approved equal.

C. Non-Metallic Waterstops — Non-metallic waterstops shall be manufactured from a fully cross-liked thermoplastic vulcanizate, containing no scrap or reclaimed material.

1. Thermoplastic Vulcanizate (TPV) Waterstop shall conform to EPA Title 40 CFR Section 265.193. The suitability of the waterstop for a specific application should be determined by specific testing for that particular requirement by ASTM D 471.
2. Thermoplastic Vulcanizate (TPV) Waterstop shall be certified for use in potable water per NSF/ANSI Standard 61. Third-party certified documentation to be provided by manufacturer.

Thermoplastic Vulcanizate (TPV) Waterstop shall conform to the following typical physical properties:

Property	Test Method	Required Results
Specific Gravity	ASTM D 792	.96
Shore A Hardness (5 sec.)	ASTM D 2240	90±3 at 77°F
Tensile Strength	ASTM D 412	2,300 psi
Ultimate Elongation	ASTM D 412	530%
100% Modulus	ASTM D 746	1,000 psi
Tear Strength	ASTM D 624	278 pli at 77°F

Property	Test Method	Required Results
Compression Set	ASTM D 395	29% at 77°F
Brittle Point	ASTM D 746	-78°F
Drinking Water Safe	NSF/ANSI 61	Certified for use in potable water *(see Appendix B).*
Ozone Resistance	ASTM D 1171	Passed, no cracking at 500 pphm
Chemical Resistance	ASTM D 471	Meet or exceed specific testing standards for contained fluids as required by Owner and *certified* by Manufacturer.
Green Certification	GreenSpec	Approved

Unless otherwise specified or indicated on the drawings provide the following types or approved equal:

1. **Part No. JP436** — 4" x 3/16" ribbed centerbulb, as manufactured by **JP Specialties, Inc.** *(all-purpose waterstop; if specified with factory installed brass eyelets use part no. EYJP436)* NSF
2. **Part No. JP636** — 6" x 3/16" ribbed centerbulb, as manufactured by **JP Specialties, Inc.** *(all-purpose waterstop; if specified with factory installed brass eyelets use part no. EYJP636)* NSF
3. **Part No. JP936** — 9" x 3/16" ribbed centerbulb, as manufactured **JP Specialties, Inc.** *(all-purpose waterstop; if specified with factory installed brass eyelets use part no. EYJP936)* NSF
4. **Part No. JP678** — 6" x 3/16" ribbed tear web, as manufactured by **JP Specialties, Inc.** *(for extreme joint movement; if specified with factory installed brass eyelets use part no. EYJP678)* NSF
5. **Part No. JP978** — 9" x 3/16" ribbed tear web, as manufactured by **JP Specialties, Inc.** *(for extreme joint movement; if specified with factory installed brass eyelets use part no. EYJP978)* NSF
6. **Part No. JP211** — 9" x 3/16" base seal, as manufactured by **JP Specialties, Inc.** *(for runway and pavement applications)* NSF
7. **Part No. JP320L** — 3" x 3/16" tear web retrofit, as manufactured by **JP Specialties, Inc.** *(for joining concrete to existing surface; if specified with factory installed brass eyelets use part no. EYJP320L)* NSF
8. **Part No. JP325T** — 3" x 3/16" T-shaped retrofit, as manufactured by **JP Specialties, Inc.** *(for joining concrete to existing surface; if specified with factory installed brass eyelets use part no. EYJP325T)* NSF
9. **Part No. JP336L** — 3" x 3/16" retrofit, as manufactured by **JP Specialties, Inc.** (*for joining concrete to existing surface; if specified with factory installed brass eyelets use part no. EYJP336L)* NSF
10. **Part No. JP621L** — 4-1/2" x 3/16" large movement retrofit, as manufactured by **JP Specialties, Inc.** (*for joining concrete to existing surface; large shear movements)* NSF
11. **Part No. JP450T** — 5" x 3/16" T-shaped retrofit, as manufactured by **JP Specialties, Inc.** *(for joining concrete to existing surface; if specified with factory installed brass eyelets use part no. EYJP450T)* NSF
12. **Part No. JP647** — 6" x 1/4" dumbbell, as manufactured by **JP Specialties, Inc.** *(for construction joints)* NSF
13. **Part No. JP648** — 6" x 3/8" dumbbell, as manufactured by **JP Specialties, Inc.** *(especially designed for Carollo Engineers [construction joints])* NSF
14. **Part No. JP948** — 9" x 3/8" dumbbell, as manufactured by **JP Specialties, Inc.** *(for construction joints)* NSF
15. **Part No. JP949** — 9" x 3/8" dumbbell centerbulb, as manufactured by **JP Specialties, Inc.** *(especially designed for Carollo Engineers [expansion joints])* NSF

16. **Part No. JP1149** — 12” x 3/8” dumbbell centerbulb, as manufactured by **JP Specialties, Inc.** *(especially designed for Carollo Engineers [expansion joints])* NSF
17. **Part No. JP158** — 1” screed key cap, as manufactured by **JP Specialties, Inc.** *(designed for keyed joints)* NSF
18. **Part No. JPEB350** — 1/2” integrated cap seal waterstop, as manufactured by **JP Specialties, Inc.** *(designed for expansion joints; if specified with factory installed brass eyelets use part no. EYJPEB350)*
19. **Part No. JPEB375** — 3/4” integrated cap seal waterstop, as manufactured by **JP Specialties, Inc.** *(designed for expansion joints; if specified with factory installed brass eyelets use part no. EYJPEB375)*
20. **Part No. JPEB375R** — 3/4” integrated cap seal retrofit waterstop, as manufactured by **JP Specialties, Inc.** *(designed for expansion joints; if specified with factory installed brass eyelets use part no. EYJPEB375R)*

PART 3 - EXECUTION

3.01 Waterstop, Installations and Splices

A. Waterstops shall be installed at the locations shown to form a continuous fluid-tight diaphragm. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. Any waterstop punctured or damaged shall be repaired or replaced.

B. Exposed waterstops shall be protected during application of form release agents to avoid being coated. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued. Splices shall be made by certified, trained personnel using approved equipment and procedures.

C. Non-Metallic Shop Made Fittings — Fittings shall be shop made using a machine specifically designed to mechanically weld the waterstop. A miter guide, proper fixturing (profile dependent), and portable power saw shall be used to miter cut the ends to be joined to ensure good alignment and contact between joined surfaces. The splicing of straight lengths shall be done by squaring the ends to be joined and using an ST-10® waterstop splicing tool. Continuity of the characteristic features of the cross section of the waterstop (ribs, tabular center axis, protrusions, etc.) shall be maintained across the splice.

D. Thermoplastic Vulcanizate Waterstop — The splicing of straight lengths shall be done by squaring the ends to be joined and using an ST-10® waterstop splicing tool utilizing a thermoplastic splicing iron with a non-stick surface specifically designed for waterstop welding. The correct temperature (410°F to 430°F) shall be used to sufficiently melt without charring the plastic. The spliced area, when cooled, shall show no signs of separation, holes, or other imperfections when bent by hand in as sharp an angle as possible.

3.02 Preparation

A. Uncoil waterstop 24 hours prior to installation for ease of handling and fabrication.

B. Position waterstop to ensure proper distance from steel reinforcing bars to prevent rock pockets and honeycomb (see installation section 3.04).

C. Protect waterstop from damage during progress of work.

D. Clean concrete joint after first pour to remove debris and dirt.

3.03 Examination/Inspection

A. Prior to placement of concrete notify engineer for field inspection approval.

B. Inspect waterstop and field splices for defects and conformance to Quality Assurance Standard section 3.05.

C. Upon inspection of waterstop installation, replace any damaged or unacceptable waterstop and dispose of defective material.

3.04 Installation

A. Position waterstop in joint as indicated on drawings.

B. Center waterstop on joint, with approximately one-half of waterstop width to be embedded in concrete on each side of the joint.

C. Allow clearance between waterstop and reinforcing steel of a minimum two times the largest aggregate size. Prevent rock pockets and air voids caused by aggregate bridging.

D. Ensure centerbulb is not embedded at expansion joints.

E. Secure waterstop in correct position using optional factory-installed brass eyelets (or JPS hog rings crimped between last two ribs on 12 inch maximum centers), and wire tie to adjacent reinforcing steel. Center-to-center spacing may be increased upon written request and approval from ENGINEER.

F. Carefully place concrete without displacing waterstop from proper position.

G. Thoroughly and systematically vibrate concrete in the vicinity of the joint, and to maximized intimate contact between concrete and waterstop.

H. After first pour, clean unembedded waterstop leg to ensure full contact of second concrete pour. Remove laitance, spillage, form oil and dirt.

3.05 Quality Assurance — Edge welding will not be permitted. Centerbulbs shall be compressed or closed when welding to non-centerbulb type. Waterstop splicing defects which are unacceptable include, but are not limited to the following:

A. Tensile strength not less than 60 percent of parent sections.

B. Free lap joints.

C. Misalignment of centerbulb, ribs, and end bulbs greater than 1/16 inch.

D. Misalignment which reduces waterstop cross section ore than 15 percent.

E. Bond failure at joint deeper than 1/16 inch or 15 percent of material thickness.

F. Misalignment of waterstop splice resulting in misalignment of waterstop in excess of 1/2 inch in 10 feet.

G. Visible porosity in the weld.
H. Charred or burnt material.

I. Bubbles or inadequate bonding.

J. Visible signs of splice separation when cooled splice (24 hours or greater) is bent by hand at sharp angle.

APPENDIX A
Earth Shield® Thermoplastic Vulcanizate Waterstop (TPER/TPV) — Effect of 166 hour immersion (ASTM D-471) on properties of Earth Shield® Thermoplastic Vulcanizate Waterstop

Fluids	Temp., °C	Ultimate Elongation Percent Retention	Ultimate Tensile Strength Percent Retention	100% Modulus Percent Retention	Hardness, Change, Shore A Units	Weight Change Percent
98% Sulfuric Acid	23	77	82	108	-1	2.1
10% Hydrochloric Acid	23	88	87	85	6	0.3
50% Sodium Hydroxide	23	101	107	104	-4	-0.1
10% Potassium Hydroxide	23	101	101	106	-1	0.1
Water	100	84	94	106	4	2.9
10% Zinc Chloride	23	89	87	83	5	0
Sea Water	23	98	107	99	4	0.3
15% Sodium Chloride	23	93	90	94	5	0.7
18% Calcium Chloride/14% Calcium	150	71	86	110	-2	-0.1
Bromide, 2.5% Detergent (Tide®)	23	103	103	103	0	-0.1
Acetic Acid	23	103	102	102	-2	3.2
Acrylonitrile	23	102	104	110	-4	0.9
Aniline	23	99	94	99	-2	1.5
Bromobenzene	23	94	91	88	-3	41.9
n-Butyl Acetate	23	95	92	80	5	0.3
Carbon Disulfide	23	94	68	82	-19	60.4
Cyclohexane	23	63	58	62	-6	45.3
Diethyl Ether	23	98	97	95	-7	-1.8
Dimethylformamide	23	96	105	100	6	0
Dioctyl Phthalate	23	101	97	103	-1	-0.2
1,4-Dioxane	23	98	94	95	-3	1.1
95% Ethanol	23	106	98	99	0	-1.7
Glycerol	23	102	101	103	-2	-0.2
n-Hexane	23	90	92	94	-10	5.7
Isophorone Diisocyanate	23	101	92	105	7.2	.30
Methylethylketone	23	95	94	79	6	-4.8
Nitrobenzene	23	100	98	102	-2	-1.5
Piperidene	23	98	105	94	6	-1.9
1-Propanol	23	93	98	100	6	-4.3
Toluene Diisocyanate	23	88	98	103	7.2	4.93
Pyridine	23	98	105	94	6	-1.9
Trichloroethylene	23	101	105	85	-13	97.2
Turpentine	23	80	75	85	-10	34.8
Xylene	23	84	85	90	-11	24.9

Fluids	Temp., °C	Ultimate Elongation Percent Retention	Ultimate Tensile Strength Percent Retention	100% Modulus Percent Retention	Hardness, Change, Shore A Units	Weight Change Percent
ASTM #1 Oil	100	88	91	99	1	13.5
ASTM #1 Oil	125	70	78	91	-1	21.6
ASTM #2 Oil	100	82	86	93	-2	27.1
ASTM #2 Oil	125	65	79	93	-6	40.1
ASTM #3 Oil	100	72	75	80	-6	41.6
ASTM #3 Oil	125	60	71	83	-13	59.8
IRM 902	100	85	86	100	-5	20.8
IRM 902[2]	125	71	79	97	-7	29.3
IRM 903	100	76	78	91	-9	35.4
IRM 903[2]	125	60	69	84	-15	50.6
Reference Fuel A (Isooctane)	23	86	85	82	-1	13.2
Reference Fuel B (Isooctane/Toluene, 70/30)	23	82	84	81	-7	24.5
Reference Fuel C (Isooctane/Toluene, 50/50)	23	67	68	75	-4	29.4
Diesel	23	89	81	87	-11	17
JP4 Jet Fuel	23	100	71	79	-11	17
JP8 Jet Fuel	23	100	93	95	-7	8
Kerosene	23	92	85	88	-10	15
Automatic Transmission Fluid	125	63	77	82	-11	43.4
Hydraulic Brake Fluid	23	95	102	95	5	-1.8
Hydraulic Brake Fluid 2	100	89	94	97	6	-12.8
Lithium Grease	23	93	98	92	5	3.5
Lithium Grease	100	88	88	92	-7	18.8
Power Steering Fluid	125	54	59	68	-12	52.2
Antifreeze, 50/50 Ethylene Glycol (Prestone®)/water	125	84	99	96	2	3.1
Pydraul® 312	125	79	85	90	0	17.6
Skydrol® 500 B4	125	93	104	101	4	-4.2
Sunvis® 706 Fluid	125	67	77	84	-8	39.9
Ucon® CC732	125	91	99	96	2	5.3
Ucon® 50HB5100	125	91	99	96	2	5.3
Freon® 11	5	92	88	88	-9	32.3

All solution concentrations by weight.

APPENDIX B

Earth Shield® Thermoplastic Vulcanizate Waterstop (TPER/TPV) — NSF International Drinking Water System Components — Health Effects.

NSF International *(NSF)*
DRINKING WATER ADDITIVES AUTHORIZED REGISTERED FORMULATION
AUTHORIZED REGISTERED FORMULATION - STANDARD 61
TOXICOLOGY INFORMATION SHEET

REVISED Revised function and listing footnote

DCC: IA12497 **Page 1 of** 2
Verified By: (1455) Issue Date 1-OCT-03

Corp. No. 1D630
Plant No. 1D631

Company Name JP SPECIALTIES, INC. / EARTH SHIELD WATE
Plant Address 551 BIRCH STREET
LAKE ELSINORE CA 92530

Category: JOINING AND SEALING MATERIALS
Function: Waterstop

Trade Designation	**Size**
Earth Shield Waterstop	
JP158	
JP211	
JP320L	
JP336L	
JP325T	
JP450T	
JP436	
JP636	
JP647	
JP936	
JP949	
JP678	
JP1149	
JP948	
JP648	

Water Contact Temp. CLD 23
Water Contact Material and Code TPE

Listing Footnotes:
This material is approved as a waterstop for use in any potable water treatment or retaining structure.

All information is presented in good faith and the results are believed to be accurate. All testing was done independently of Earth Shield and JP Specialties, Inc.; therefore, neither Earth Shield nor JP Specialties, Inc. makes any guarantee as to the testing data accuracy or the results obtained.

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete with shoring and bracing
2. Formwork accessories
3. Form stripping
4. Reinforcing steel for cast-place-concrete
5. Cast-in-place concrete including the following:
   a. Foundations and footings
   b. Foundation walls
   c. Floor slabs
   d. Retaining Walls
   e. Equipment pads and bases
   f. Steel pan stairs
   g. Exterior stairs
6. Concrete curing.

B. Related Sections:

1. Division 05 Section "Steel Decking"

1.2 REFERENCES

A. General:

1. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the work. Where differences exist between codes and standards, the one affording the greatest protection shall apply.

B. American Concrete Institute (ACI):

1.	ACI 117	Specification for Tolerances for Concrete Construction
2.	ACI 211.1	Proportioning Concrete Mixtures
3.	ACI 301	Specifications for Structural Concrete
4.	ACI 303.1	Specification for Cast-in-Place Architectural Concrete
5.	ACI 305	Hot Weather Concreting
6.	ACI 306	Specifications for Cold Weather Concreting
7.	ACI 308	Specifications for Curing Concrete
8.	ACI 309	Consolidation of Concrete
9.	ACI 318	Building Code Requirements for Structural Concrete

1.3 SUBMITTALS

A. Product Data: Provide data for proprietary materials, including admixtures curing materials, and finish materials.

B. Submit Placement Shop Drawings, showing location of construction joints. Clearly indicate the construction joints in different locations that those shown in the drawings.

C. Samples: As requested by testing laboratory.

D. Mix design for each concrete mix.

E. Include compression test data used to establish mix proportions.

F. Submit certification that the facilities of the ready-mix plant comply with the requirements of ASTM C94.

G. Material Certificates.

1. Cementitious materials, including supplemental cementitous material.
2. Aggregates, including gradation and combined gradation.
3. Admixtures. Where more than one admixture is proposed, include statement from admixture manufacturer indicating that admixtures proposed for use are compatible, such that desirable effects of each admixture will be realized.

H. Submit ticket to Testing Laboratory for each batch of concrete delivered.

1. Mix identification.
2. Weights of cementitious materials, aggregates, water and admixtures, and aggregate size.

1.4 QUALITY ASSURANCE

A. Standards: Comply with provisions of ACI 301, except where more stringent requirements are indicated. Evaluation and acceptance of concrete structures will be in accordance with ACI 301.

B. Concrete Mix Design: Submit proposed mix designs and test data before concrete operations begin. Identify for each mix submitted the method by which proportions have been selected. Each mix shall be identified as it will appear on batch tickets delivered to project site.

1. For mix designs based on field experience, include individual strength test results, standard deviation, and required average compressive strength calculations.
2. For mix designs based on trial mixtures, include trial mix proportions, test results, and graphical analysis and show required average compressive strength.
3. Indicate quantity of each ingredient per cubic yard of concrete.
4. Indicate type and quantity of admixtures proposed or required.

C. Certificates of Compliance: Acceptability of the following materials will be based upon documentation furnished by the manufacturer identifying each batch of material and certifying compliance with the requirements specified:

1. Portland cement.
2. Fly ash.
3. Chemical admixtures.

D. Certified Laboratory Test Reports: Before delivery of materials submit certified copies of the reports of the tests required in referenced standards or otherwise specified here. The testing shall have been performed by an independent laboratory within one year of submittal of test reports for approval. Test reports on a previously tested material shall be accompanied by certificates from the manufacturer certifying that the previously tested material is of the same type, quality, manufacture and make as that proposed for use in the project. Certified test reports are required for the following:

1. Portland Cement.
2. Aggregates.
3. Admixtures.

E. Survey anchor bolts for placement and alignment prior to casting concrete.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to project site bundled and tagged with metal tags, indicating bar size, lengths, and other data corresponding to information shown on placement drawings.

B. Store concrete reinforcement materials at the site to prevent damage and accumulation of dirt or rust.

C. Store cementitious materials in a dry, weathertight location. Maintain accurate records of shipment and use.

D. Store aggregates to permit free drainage and to avoid contamination with deleterious matter or other aggregates. When stockpiled on ground, discard bottom 6 inches of pile.

1.6 PROJECT CONDITIONS

A. Cold-Weather Concreting: Comply fully with the recommendations of ACI 306.

1. Well in advance of proposed concreting operations, advise the engineer of planned protective measures including but not limited to heating of materials, heated enclosures, and insulating blankets.

B. Hot-Weather Concreting: Comply fully with the recommendations of ACI 305.

1. Well in advance of proposed concreting operations, advise the engineer of planned protective measures including but not limited to cooling of materials before or during mixing, placement during evening to dawn hours, fogging during finishing and curing, shading, and windbreaks.

PART 2 - PRODUCTS

2.1 FORMWORK

A. Facing Materials:

1. Unexposed finish concrete: Any standard form materials that produce structurally sound concrete.
2. Exposed finish concrete: Materials selected to offer optimum smooth, stain-free final appearance and minimum number of joints. Provide materials with sufficient strength to resist hydrostatic head without bow or deflection in excess of allowable tolerances.

B. Formwork Accessories:

1. Foam coating: Foam release agent that will not adversely affect concrete surfaces or prevent subsequent application of concrete coatings.
2. Metal ties: Commercially manufactured types; cone snap ties, taper removable bolt, or other type which will leave no metal closer than 1-1/2 inches from surface of concrete when forms are removed, leaving not more than a 1-inch-diameter hole in concrete surface.

3. Fillets: Wood or plastic fillets for chamfered corners, in maximum lengths possible.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: Provide deformed bars complying with ASTM A615, Grade 60, except where otherwise indicated.

B. Reinforcing Bar Mats: ASTM A184.

C. Welded Wire Fabric: ASTM A1064, cold-drawn steel, plain.

D. Reinforcing Accessories:

1. Tie wire: Black annealed type, 16-1/2 gage or heavier.
2. Supports: Bar supports conforming to specifications of CRSI "Manual of Standard Practice."
   a. Class 1 (plastic protected) where legs of wire bar supports contact forms.
   b. Precast concrete blocks of strength equal to or greater than specified strength of concrete or Class 3 supports equipped with sand plates, where concrete will be cast against earth. Concrete masonry units will not be accepted.

2.3 CONCRETE MATERIALS

A. Cementitious materials and aggregates for exposed concrete shall be from same source throughout the work.

B. Cementitious Material: An intimate blend of Portland cement and supplemental cementitious material. Cementitious material shall include a maximum of 15 percent fly ash or ground blast furnace slag by weight unless the strength is specified to be achieved in 7 or 14 days. Cementitious material shall comply with ACI 318 Chapter 4 requirements for exposure class S1.

C. Portland Cement: ASTM C150 and as follows:

1. Type I except where other type is specifically permitted or required.
   a. Type I can be replaced by Type III (high early strength) for concrete placed during cold weather.

D. Supplemental Cementitious Materials:

1. Fly Ash: ASTM C618, Class F with the following Modified ASTM requirements:
   a. Loss of Ignition (L.O.I.): maximum 1 percent.
   b. Sulfur Trioxide (SO3) shall not exceed 3 percent by weight.
2. Ground Blast Furnace Slag: ASTM C989.

E. Aggregates

1. Normal weight concrete: ASTM C33.
   a. Class S3
2. Light weight concrete: ASTM C330.
3. Maximum size of coarse aggregate, whichever is least:
   a. One-fifth narrowest dimension between sides of forms.
   b. Three-fourths of minimum clear distance between reinforcing bars or between bars and side of form.

c. Columns and piers: Two-thirds of minimum clear distance between bars.

F. Water: Mixing water shall be clean, potable and free from deleterious material.

G. Admixtures - General

1. Admixtures containing more than 0.1 percent chloride ions are not permitted.
2. Where mix contains more than one admixture, all admixtures shall be supplied by one manufacturer. Manufacturer shall certify that admixtures are compatible such that desirable effects of each admixture will be realized.
3. Liquid admixtures shall be considered part of the total water.

H. Water Reducing Admixture: ASTM C494, Type A. Provide in all concrete at necessary dosage to facilitate placement.

I. Mid to High Range Water Reducing Admixture: ASTM C494, Type F; polycarboxylate formulation. Provide in mid-range or high-range dosage as necessary for placement at the maximum water to cement ratio specified.

J. Set Accelerating Admixture: ASTM C494, Type E, non-chloride. Subject to approval of engineer, provide in necessary dosage to accelerate set.

K. Set Retarding Admixture: ASTM C494, Type D. Subject to approval of engineer, provide in necessary dosage to retard set.

L. Fibrous Reinforcement: Polypropylene fibers designed and engineered specifically for secondary reinforcement of concrete.

2.4 ACCESSORIES

A. Curing Compounds: ASTM C309, Type 1 which will not discolor concrete or affect bonding of other finishes applied, and which restricts loss of water to not more than 0.500 grams per square centimeter of surface when tested per ASTM C156, “Test Method for Water Retention by Concrete Curing Materials.”

B. Bonding Compound: Non-redispersible acrylic bonding admixture, ASTM C1059, Type II.

C. Slab Curing Membrane: Membrane conforming to ASTM C171, non-staining.

D. Burlap Sheet: AASHTO M182, class 3 or 4.

E. Vapor Barrier: ASTM D2103, “Polyethylene Film and Sheeting.”

F. Grout: ASTM C1107, Grade B non-shrink, non-metallic, prepackaged grout.

G. Waterstops: Provide waterstops at construction joints and as otherwise indicated, sized and configured to suit joints.

H. Expansion Joint Filler: Nonextruding bituminous type: ASTM D1751.

2.5 CONCRETE MIXES

A. Proportioning of Concrete: Comply with recommendations of ACI 211.1.

B. Required Average Strength: Establish the required average strength of the design mix on the basis of either field experience or trial mixtures as specified in ACI 301, and

proportion mixes accordingly. If trial mixture method is used, employ an independent testing agency acceptable to the engineer for preparing and reporting proposed mix design.

C. Specified compressive strength f'(c) at 28 days:

1. Foundations and footings: 4000 psi.
2. Walls, columns, suspended slabs, and beams: 4000 psi.
3. Floor slabs on grade: 4000 psi
4. Concrete fill on metal deck: 4000 psi.
5. Site walls and sidewalks: 5000 psi.

D. Slump: The concrete mix design shall provide for a concrete slump appropriate to the project conditions. The concrete shall be sufficiently fluid to allow for ease of placement and sufficiently stiff to prevent segregation.

E. Fibrous Reinforcement: Where specified or approved, add to mix at rate recommended by manufacturer for specific application.

1. Add to concrete mix in lieu of providing welded wire fabric reinforcement for interior floor slabs, at contractor's option and with prior approval of engineer.

F. Water to Cementitious Material Ratio: Water-to-cementitious-material ratio shall not exceed 0.40 by weight for exterior exposed concrete. Weight of water shall include all free moisture, including liquid admixtures.

G. Air-entraining admixture: Use in mixes for exterior exposed concrete unless otherwise specifically indicated. Add at rate to achieve total air content of 6 percent. For concrete not exposed to exterior, add at rate to achieve total air content between 2 percent and 4 percent.

H. Water-reducing admixture: Add as required for placement and workability.

I. Water-reducing and retarding admixture: Add as required in concrete mixes to be placed at ambient temperatures above 90 degrees F.

J. Water-reducing and accelerating admixture: Add as required in concrete mixes to be placed at ambient temperatures below 50 degrees F.

K. High-range water-reducing admixture (superplasticizer): As required for placement and workability.

L. Mix Adjustments: Provided that no additional expense to owner is involved, contractor may submit for approval requirements for adjustment to approved concrete mixes when circumstances such as changed project conditions, weather, or unfavorable test results occur. Include laboratory test data substantiating specified properties with mix adjustment requests.

2.6 CONTROL OF MIX IN THE FIELD

A. Slump: A tolerance of up to 1 inch above approved design mix slump will be permitted for 1 batch in 5 consecutive batches tested. Concrete of lower slump than that specified may be used, provided proper placing and consolidation is obtained.

B. Total Air Content: A tolerance of plus or minus 1 percent of approved design mix air content will be allowed for field measurements.

C. Do not use batches that exceed tolerances.

PART 3- EXECUTION

3.1 FORMWORK ERECTION

A. General: Comply with requirements of ACI 301 for formwork, and as herein specified. The contractor is responsible for design, engineering, and construction of formwork, and for its timely removal.

B. Earth forms: Hand trim sides and bottom of earth forms; remove loose dirt.

C. Design: Design and fabricate forms for easy removal, without impact, shock, or damage to concrete surfaces or other portions of the work. Design to support all applied loads until concrete is adequately cured, within allowable tolerances and deflection limits.

D. Construction: Construct and brace formwork to accurately achieve end results required by contract documents, with all elements properly located and free of distortion. Provide for necessary openings, inserts, anchorages, and other features shown or otherwise required.

1. Joints: Minimize form joints and make watertight to prevent leakage of concrete.
   a. Align joints symmetrically at exposed conditions.
2. Chamfers: Provide chamfered edges and corners at exposed locations, unless specifically indicated otherwise on the drawings.
3. Permanent openings: Provide openings to accommodate work of other trades, sized and located accurately. Securely support items built into forms; provide additional bracing at openings and discontinuities in formwork.
4. Temporary openings: Provide temporary openings for cleaning and inspection in most inconspicuous locations at base of forms, closed with tight-fitting panels designed to minimize appearance of joints in finished concrete work.

E. Tolerances for Formed Surfaces: Comply with minimum tolerances established in ACI 117, unless more stringent requirements are indicated on the drawings.

F. Release Agent: Provide either form materials with factory-applied nonabsorptive liner or field-applied form coating. If field-applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use.

3.2 REINFORCEMENT AND EMBEDDED ITEMS

A. Preparation: Clean reinforcement of loose rust and mill scale, soil, and other materials which adversely affect bond with concrete.

B. Placement: Place reinforcement to achieve not less than minimum concrete coverage as required for protection. Accurately position, support, and secure reinforcement against displacement. Provide Class B tension lap splices complying with ACI 318 unless otherwise indicated. Do not field-bend partially embedded bars unless otherwise indicated or approved.

1. Use approved bar supports and tie wire, as required. Set wire ties to avoid contact with or penetration of exposed concrete surfaces. Tack welding of reinforcing is not permitted.

2. Wire fabric: Install in maximum lengths possible, lapping adjoining pieces not less than one full mesh. Offset end laps to prevent continuous laps in either direction, and splice laps with tie wire.

C. Welding: Welding of reinforcement is not permitted.

D. Installation tolerances for anchor bolts for structural steel columns shall comply with the AISC Code of Standard Practice for Steel Buildings and Bridges.

3.3 JOINT CONSTRUCTION

A. Construction Joints: Locate and install construction joints as indicated on drawings. If construction joints are not indicated, locate in manner which will not impair strength and will have least impact on appearance.

1. Keyways: Provide keyways not less than 1-1/2 inches deep.
2. Reinforcement: Continue reinforcement across and perpendicular to construction joints, unless details specifically indicate otherwise.
3. Waterstops: Provide waterstops as indicated, installing to form continuous, watertight dam, with field joints fabricated in strict accordance with manufacturer's instructions.

B. Expansion Joints: Construct expansion joints where indicated. Install expansion joint filler to full depth of concrete. Recess edge of filler to depth indicated to receive joint sealant and backer rod where necessary.

3.4 PLACING CONCRETE

A. The rate of delivery, haul time, missing time and hopper capacity shall be such that all mixed concrete delivered shall be placed in forms within 90 minutes from the time of the introduction of cement and water into the mixer.

B. No water shall be added after transit mixer leaves the batching.

C. Prepare previously placed concrete by cleaning and applying bonding agent in accordance with manufacturer's instruction.

D. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with epoxy grout.

E. Foundation surfaces against which concrete is to be placed must be free from standing water, mud and debris. Surfaces shall be clean and free from oil, objectionable coatings, and loose or unsound material.

F. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.

1. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.

2. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.

3. Do not use vibrators to move concrete laterally.

G. Cold Weather Placement: Comply with recommendations of ACI 306 when air temperatures are expected to drop below 40 degrees F either during concrete placement operations or before concrete has cured.

1. Do not use frozen or ice-laden materials.
2. Do not place concrete on frozen substrates.

H. Hot Weather Placement: Comply with recommendations of ACI 305 when ambient temperature before, during, or after concrete placement is expected to exceed 90 degrees F or when combinations of high air temperature, low relative humidity, and wind speed are such that the rate of evaporation from freshly poured concrete would otherwise exceed 0.2 pounds per square foot per hour.

1. Do not add water to approved concrete mixes under hot weather conditions.
2. Provide mixing water at lowest feasible temperature and provide adequate protection of poured concrete to reduce rate of evaporation.
3. Use fog nozzle to cool formwork and reinforcing steel immediately prior to placing concrete.

3.5 FLOOR SLABS

A. Place floor slabs on grade as indicated on drawings. Saw cut control joints at an optimum time after finishing. Cut slabs with a 3/16-inch (8 mm) thick blade to 1 inch (25 mm) depth. Locate control joints at a maximum spacing of 36 times the slab depth and at each corner and plan irregularity.

B. Separate slabs on grade from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within ¼ inch of finished slab surface.

C. Construct slab on grade and shored elevated floor slabs with overall specified FF30/FL20 and with minimum FF15/FL10 for individual floor sections in accordance with ACI 302.1. Determination of FF/FL numbers will be in accordance with ASTM E 1155. The contractor will take remedial measures when floor slabs do not meet specified requirements.

3.6 FINISHING FORMED SURFACES

A. Repairs: Repair surface defects, including tie holes, immediately after removing formwork.

1. Remove honeycombed areas and other defective concrete down to sound concrete, cutting perpendicular to surface or slightly undercutting. Dampen patch location and area immediately surrounding it prior to applying bonding compound or patching mortar.
2. Before bonding compound has dried, apply patching mixture matching original concrete in materials and mix except for omission of coarse aggregate, and using a blend of white and normal Portland cement as necessary to achieve color match. Consolidate thoroughly and strike off slightly higher than surrounding surface.

B. Unexposed Form Finish: Repair tie holes and patch defective areas. Rub down or chip off fins or other raised areas exceeding 1/4 inch height.

C. Exposed Form Finish: Repair and patch defective areas, with fins or other projections completely removed and smoothed.

1. Smooth rubbed finish: Apply to surfaces indicated no later than 24 hours after form removal.
2. Wet concrete surfaces to be finished and rub with abrasive until uniform color and texture are achieved.
3. Do not apply separate grout mixture.

D. Contiguous unformed surfaces: Strike smooth and float to a similar texture tops of walls, horizontal offsets, and other unformed surfaced adjacent to or contiguous with formed surfaces. Continue final finish of formed surfaces across unformed surfaces, unless otherwise specifically indicated.

3.7 CURING AND PROTECTION

A. Working and walking on concrete shall be avoided for at least 24 hours after casting. Protect concrete from sun and rain. Do not permit concrete to become dry during curing period. Concrete shall not be subjected to any loads until concrete is completely cured, and until concrete has attained its 28 day strength and 14 days minimum.

B. Protect concrete during and after curing from damage during subsequent building construction operations.

C. Cover traffic areas with plywood or other suitable means for as long as necessary to protect concrete from damage.

D. Immediately upon completion of finishing operation, the surface of slabs shall be sealed against moisture loss by the application of one of the following methods for 7 days:

1. Apply a curing blanket made of polyetheylene bonded to burlap in accordance with the manufacturer's instructions.
2. Apply waterproof curing paper with edges lapped and sealed with tape. The curing membrane shall be weighted down. Tears and rips in curing membrane shall be repaired immediately during curing period.

E. Specific curing requirements for walls, beams and columns shall include the following:

1. Concrete in forms shall be kept moist until removal.
2. Immediately upon removal of forms, an approved sprayed-on curing compound shall be applied to the concrete surfaces in strict compliance with the manufacturer's recommendations.
3. Curing shall be maintained for 7 days.

3.8 MISCELLANEOUS CONCRETE ITEMS

A. Fill-in: Fill in holes and openings left in concrete structures for passage of work by other trades after such work is in place. Place such fill-in concrete to blend with existing construction, using same mix and curing methods.

B. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Screed, tamp, and finish concrete surfaces as scheduled.

C. Reinforced Masonry: Provide concrete grout for reinforced masonry where indicated on drawings and as scheduled.

3.9 FIELD QUALITY CONTROL

A. Composite Sampling and Making and Curing of Specimens: ASTM C172 and ASTM C31.

1. Take samples at point of discharge.
2. For pumped concrete, perform sampling and testing at the frequencies specified herein at point of delivery to pump, and perform additional sampling and testing at the same frequency at discharge from line. Results obtained at point of delivery shall be used for acceptance of concrete.
3. Take samples and perform tests for concrete before and after field addition of admixtures. Report results of all tests.

B. Slump: ASTM C143. Test first 2 loads delivered for each pour and 1 test per strength test and additional tests if concrete consistency changes.

1. Modify sampling to comply with ASTM C94.
2. For concrete containing superplasticizer added at the job site, perform slump test prior to addition of admixture and after mixing. Report both test results.
3. Visual estimate of slump may be accepted once uniform results are achieved over a minimum of 4 samples. Report all estimated results as such.

C. Air Content of concrete: ASTM C173 or ASTM C231. Test first 2 loads delivered for each pour and one test per strength test performed on air-entrained concrete.

D. Concrete Temperature:

1. Test hourly when air temperature is 40 degrees F or below.
2. Test hourly when air temperature is 90 degrees F or above.
3. Test each time a set of strength test specimens is made.

E. Compressive Strength Tests: ASTM C39.

1. Compression test specimens: Mold and cure one set of 4 standard cylinders for each compressive strength test required.

2. Testing for acceptance of potential strength of as-delivered concrete:
   a. Obtain samples on a statistically sound, random basis.
   b. Provide one test per 50 cubic yards or fraction thereof for each day's pour of each concrete class.
   c. Provide one test per 2500 square feet of slab or wall area or fraction thereof for each day's pour of each concrete class.
   d. When the above testing frequency would provide fewer than 5 strength tests for a given class of concrete during the project, conduct testing from not less than 5 randomly selected batches or from each batch if fewer than 5.
   e. Test one specimen per set at 7 days for information unless an earlier age is required.
   f. Test 2 specimens per set for acceptance of strength potential; test at 28 days unless other age is specified. The test result shall be the average of the two specimens. If one specimen shows evidence of improper sampling, molding, or testing, the test result shall be the result of the remaining specimen; if both show such evidence, discard the test result and inform the engineer.
   g. Retain one specimen from each set for later testing, if required.
   h. Strength potential of as-delivered concrete will be considered acceptable if all of the following criteria are met:

i. No individual test result falls below specified compressive strength by more than 500 psi.
ii. Not more than 10 percent of individual test results fall below specified compressive strength.
iii. Average of any 3 consecutive strength test results equals or exceeds specified compressive strength.

i. Evaluate construction and curing procedures and implement corrective action when strength results for field-cured specimens area less than 85 percent of test values for companion laboratory-cured specimens.

F. Test Results: Testing agency shall report field and laboratory test results in writing to engineer and contractor within 24 hours of test.

1. Field test results which do not comply with the project specifications shall be immediately reported to project superintendent. Field reports shall include documentation of all such reports and the name of the person results were reported to.
2. Test reports shall contain the following data:
   a. Project name, number, and other identification.
   b. Name of concrete testing agency.
   c. Date and time of sampling.
   d. Concrete type and class.
   e. Location of concrete batch in the completed work.
   f. All information required by respective ASTM Test methods.
   g. Concrete mix parameters and tolerances.
3. Nondestructive testing may be used at engineer's option for assistance in determining probable concrete strength at various locations or for selecting areas to be cored, but such tests shall not be the sole basis for acceptance or rejection.
4. The testing agency shall make additional tests of in-place concrete as directed by the engineer when test results indicate that specified strength and other concrete characteristics have not been attained.
   a. Testing agency may conduct tests of cored cylinders complying with ASTM C42, or tests as directed.
   b. Cost of additional testing shall be borne by the contractor when unacceptable concrete has been verified.

END OF SECTION 033000

SECTION 034000 - PRECAST CONCRETE HOLLOW CORE SLABS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work of Other Sections:

1. Cast-In-Place Concrete: Section 033000.
2. Structural Framing: Section 051200.

1.02 QUALITY ASSURANCE

A. Manufacturer: The manufacturer shall have a proven background of experience and record of performance required for this project.

B. Requirements of Regulatory Agencies: Design, construction, and installation shall meet requirements of state and local building codes.

C. Allowable Tolerances:

1. Length of precast units shall be plus or minus 1/2 inch of the length indicated on the approved shop drawing.
2. Width of precast concrete units: Plus or minus 1/4 inch.
3. Thickness of precast concrete units: Plus or minus 1/4 inch.
4. Location of inserts within units: Plus or minus 1 inch.
5. Differential camber between adjacent units of the same design: Plus or minus 1/4 inch per 10 feet, but not greater than 1/2 inch.
6. Squareness of ends (vertical and horizontal alignment): Plus or minus 1/4 inch.

D. Source Quality Control: Cylinder test of concrete quality shall be made by manufacturer in accordance with ASTM C 192, for each mix design, for each day of production, or for each 100 cubic yards of concrete. Copies of such tests shall be provided to the Architect upon delivery of the precast units.

1.03 SUBMITTALS

A. Shop Drawings:

1. Drawings shall show position, span, dimensions, reinforcement, location of anchor plates or clips, and as required, openings, hanger spacing and anchoring details.
2. Submittal shall include design loads and deflection limitations for the design of the precast units.
3. The contractor shall locate all required openings to be field cut or cored on the shop drawings before submitting to the Architect for review. Upon completion of the Architect’s and Engineer’s review, the manufacturer shall revise the shop drawings and resubmit for approval.

B. Material Specifications

1. Submit material specifications for all products used in the precast unit manufacture.

1.04 DESIGN

A. Computer load tables, design calculations and shop drawings shall be prepared under the supervision of and shall bear the seal of a Professional Engineer licensed in the state in which this project is located.

B. The hollow core slabs shall be designed for the superimposed dead loads shown on the drawings and the maximum of either the live load stated on the drawings or the minimum live load required by the governing building code for the proposed occupancy.

C. The design shall properly account for load distribution of concentrated and live loads and for the effect of openings.

D. Live load deflection shall be limited to 1/480 of the total span.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transport and handle precast concrete slabs with proper equipment to protect units from dirt and damage. By accepting delivery of the precast units, the contractor represents that he has inspected the units and found no damage or defects. Exceptions must be made in writing to the manufacturer and the Architect.

B. Store precast concrete slabs to protect units from contact with soil or ground. Store units on firm surfaces to avoid warping and cracking.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete:

1. Portland cement shall conform to ASTM C 150.
2. Normal weight aggregate shall conform to ASTM C 33, for fine to coarse graduation.
3. Chemical admixtures shall conform to ASTM C 494. Calcium chloride shall not be used.
4. Water shall be free from foreign materials in amounts harmful to concrete.

B. Prestressing strands shall be uncoated 7 wire strands conforming to ASTM A 416, Grade 250 or 270.

C. Weld inserts, anchor plates, etc. shall be as shown on drawings if required for anchoring slabs to supports or bracing steel framing.

D. Headers required to safely carry design loads shall be fabricated of steel and be painted with one coat of red primer after fabrication. Determination of header requirements shall be by manufacturers' engineer.

2.02 MIXES

A. Mix design shall be in accordance with the latest edition of ACI Committee 211 with reference to ACI Subcommittee 2 report "Recommended Practice for Selecting Proportions for No-Slump Concrete."

B. Measurements of concrete mix shall be within the following limits:

1. Cement: Plus or minus 1 percent.
2. Water: Plus or minus 1 percent.
3. Fine Aggregate: Plus or minus 2 percent.
4. Coarse Aggregate: Plus or minus 2 percent.
5. Admixtures: Plus or minus 3 percent.

2.03 FABRICATION AND MANUFACTURE

A. Precast concrete slabs shall be hollow core slabs with pretensioned, prestress strands.

C. Fabrication and Design:

1. Design of precast concrete slabs shall be in accordance with the latest edition of ACI 318.
2. Concrete shall have a minimum compressive strength of 4,000 psi at 28 days.
3. Precast concrete slabs shall be designed and reinforced for all superimposed dead and live loads as shown on architectural and structural plans.
4. Prestressing strands shall be pretensioned by either a dead weight system or a single strand jacking system. Strands shall be marked for slippage, and if slipping occurs, strand shall be detensioned and restressed. Tension or strand shall be checked to insure accurate results.
5. Prestressing strands will be released when concrete reaches a strength of 3,000 psi or greater as required by design.
6. Precast concrete slabs shall be air or steam cured and shall be clean, smooth, and straight without fins, broken edges, or structural defects prior to delivery.

PART 3 - EXECUTION

3.01 INSPECTION

A. All bearing surfaces including lintels to be installed by others prior to slab erection. Where masonry walls are used as bearing surfaces, the top course shall be (filled) solid.

B. Weld angles, anchor inserts in bearing surfaces, and supporting structures shall be installed plumb to line and grade by others prior to erection of slabs. Precast concrete slab contractor will verify that structure and anchorage inserts are within allowable tolerances.

C. No broken, cracked, spalled, warped, or otherwise defective units shall be erected.

D. Where masonry walls are used as bearing surfaces, the top course shall be solid filled U-block or other solid, smooth, level surface.

3.02 PREPARATION

A. General contractor shall coordinate delivery and erection of precast concrete slabs, provide clear site, provide and maintain firm and level access roads to allow crane and trucks to reach work area under their own power.

B. Care shall be taken to protect the work and material of other trades during installation of slabs.

3.03 INSTALLATION

A. Precast concrete slabs shall be installed according to approved shop drawings and details by mechanics experienced in precast concrete slab erection.

B. Cooperate with other trades to permit inserting of anchors, hangers, etc. Hangers shall be placed before units are grouted.

C. Units shall be erected tight and at right angles to bearing surfaces unless shown otherwise. Minimum bearing shall be 3 inches on steel, 4 inches on concrete and 4 inches on masonry. Align and level precast concrete slabs using shims, bolts, or jacks.

D. Where weld inserts are shown, precast concrete slab contractor shall weld inserts in slabs to bearing surfaces.

D. Grouting Joints:

1. Clean joints before grouting.
2. Grout for joints shall be 1 part Portland cement, 3 parts sand, and water.
3. Fill joints between units with grout.
4. Remove grout that seeped through to ceiling below before grout hardens.

F. Openings greater than 10 inches square to be saw cut in field. Openings 10 inches or less may be done by trades requiring same using a diamond core drill. However, if more than two openings occur in any individual slab, approval of the precaster must be obtained prior to making any cuts. (A number of closely spaced small openings could effectively cut all prestressing strands and destroy the structural strength of the slab.)

G. All openings required in the precast slabs shall be indicated on the shop drawings. No openings shall be cut which do not appear on the shop drawings unless prior approval is obtained.

H. Where indicated on architectural plans, precast concrete slab manufacturer shall feather joints with skim coat of latex underlayment for the direct application of pad and carpet or shall apply full coat of latex underlayment for the direct application of vinyl tile.

3.04 ADJUST AND CLEAN

A. Planks that are broken, cracked, or chipped shall be repaired or replaced at the discretion of the architect and the structural engineer.

B. After erection and grouting is completed, the general contractor will be responsible for the protection of the slabs.

C. Remove rubbish and debris resulting from precast concrete slab work from premises upon completion. Protect work of this section from fabrication to installation.

END OF SECTION 034000

SECTION 035400 – CONCRETE UNDERLAYMENT PATCH

PART I – GENERAL

1.01 SUMMARY

A. This is the recommended specification for ARDEX SD-P InstantPatch, Self-Drying, Fast-Setting, Concrete Underlayment Trowelable Patch for smoothing and repairing concrete floors, ramps, stairways, as well as non-porous substrates such as terrazzo, ceramic and quarry tile prior to the installation of floor covering.

1.02 SECTION INCLUDES

A. ARDEX SD-P InstantPatch Self-Drying, Fast-Setting Concrete Underlayment Patch.

B. ARDEX LU-100 Self-Leveling Floor Underlayment

C. ARDEX P-51 Primer

D. ARDEX P-82 Ultra Prime.

E. Architect/Engineer Approved Equal.

1.03 QUALITY ASSURANCE

A. Installation of the cement-based, self-drying, fast-setting trowelable underlayment patch must be made by the applicator using mixing equipment and tools approved by the manufacturer.

B. Installation of the hydraulic cement-based, self-leveling underlayment must be by an applicator using mixing equipment and tools approved by the manufacturer.

C. Provide ARDEX SD-P InstantPatch Self-Drying, Fast-Setting Concrete Underlayment Patch as manufactured by ARDEX INC., 400 Ardex Park Drive, Aliquippa, PA 15001.

D. Underlayment shall be installed from a featheredge to ¼” over any size area, up to ½” in areas of 20 sq. ft. or less and up to 1” deep in areas up to 4 sq. ft.

E. Underlayment shall be able to be installed from a featheredge to 2” in one pour and up to 5” thick in small areas.

F. Underlayment shall develop a minimum compressive strength of 4200 psi after 28 days per ASTM C109/mod (air cure only).

G. No primer is required for underlayment when used over standard absorbent concrete.

H. Underlayment shall be able to be covered by most flooring materials as soon as the surface is sufficiently hardened (usually within an hour). Parquet, athletic flooring and flooring requiring special adhesives shall be installed in 16 hours.

I. Underlayment shall be walkable after 3 hours at 70°F and be able to be covered by finish flooring material in 2-3 days, depending upon thickness of installation.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in their unopened packages and protect from extreme temperatures and moisture. Protect liquids from freezing.

1.05 SITE CONDITIONS

A. ARDEX SD-P is a cementitious material. Observe the basic rules of concrete work. Do not install below 50°F surface temperature. Install quickly if floor is warm and follow hot weather precautions available from the ARDEX Technical Service Department. Never mix with cement or additives other than ARDEX-approved products.

B. ARDEX LU-100 contains blended hydraulic cements and powdered polymers. Do not install in applications on or below grade unless the concrete substrate has already been treated with ARDEX MC™ MOISTURE CONTROL SYSTEM or approved equal. Do not install below 50°F surface temperature. Install quickly if floor is warm and follow hot weather precautions available from the Ardex Technical Service Department. Never mix with cement or additives.

PART 2 – PRODUCTS

2.01 MATERIALS

A. The Portland cement-based, self-drying, fast-setting, trowelable underlayment patch shall be ARDEX SD-P InstantPatch Self-Drying, Fast-Setting Concrete Underlayment Patch.

B. No primer required over standard absorbent concrete.

C. Primer for non-porous, and highly smooth substrates, shall be ARDEX P-82 Ultra Prime.

D. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

E. The hydraulic cement-based self-leveling underlayment shall be ARDEX LU-100 SELF-LEVELING FLOORING UNDERLAYMENT.

F. Primer for standard absorbent concrete subfloors, well bonded patching compounds, and other porous surfaces shall be ARDEX P 51 PRIMER diluted 1:1 with water.

G. Primer for well-bonded, non-water soluble adhesive residues shall be ARDEX P 51 PRIMER undiluted or ARDEX P 82 ULTRA PRIME.

H. Primer for all other non-porous surfaces to include terrazzo, burnished or sealed concrete, ceramic and quarry tile, acrylic curing compounds, and epoxy coatings shall be ARDEX P 82 ULTRA PRIME.

I. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F)

J. Repair of small gouges, indentations and holes, as well as skim coating large areas, can be done using ARDEX FEATHER FINISH® SELF-DRYING, CEMENT-BASED FINISHING UNDERLAYMENT.

2. 02 MIX DESIGNS

A. Mixing Ratios: Standard mixing ratio: Mix 1 bag of ARDEX SD-P (40 lbs.) with 4 quarts of water. Product can be missed in a clean 5-gallon pail using ARDEX T-2 Mixing Paddle and a

½" heavy-duty drill (min. 650 rpm). Mix thoroughly for approximately 2-3 minutes to obtain a lump-free mixture. Follow written instructions per ARDEX SD-P bag label.

B. Underlayment shall be installed using a wood or magnesium float. When underlayment begins to harden, finish with a steel trowel.

C. Underlayment can receive floor covering as soon as the surface becomes sufficiently hard (about 1 hour). Parquet, athletic flooring and flooring requiring special adhesives can be installed in 16 hours.

D. Mixing Ratio: ARDEX LU-100 is mixed in 2-bag batches at one time. Mix each bag of ARDEX LU-100 (50 lb.) with 4 quarts of water. Product shall be mixed in an ARDEX T- 10 Mixing Drum using an ARDEX T-4 Mixing Paddle and a ½" heavy-duty drill (min. 650rpm). Mix thoroughly for approx. 2-3 minutes to obtain a lump-free mixture. Follow written instructions per the ARDEX LU-100 bag label.

E. For pump installations, ARDEX LU-100 shall be mixed using the ARDEX Levelcraft Automatic Mixing Pump. Start the pump at 130 gallons of water per hour, then adjust to the minimum water reading which still allows self-leveling properties. DO NOT OVERWATER! Check the consistency of the product on the floor to ensure a uniform distribution of the sand aggregate at both the top surface and bottom of the pour. If settling is occurring, reduce the water amount and recheck. Conditions during the installation, such as variations in water, powder, substrate, and ambient temperature, require that the water setting be monitored and adjusted carefully to avoid overwatering.

PART 3 – EXECUTION

3.01 PREPARATION

A. All surfaces must be sound, solid, cleaned, and where required, properly primed.

B. All concrete subfloors must be of adequate strength, clean, and free of oil, grease, dirt, curing compounds, and any substance, which might act as a bondbreaker. Mechanically clean, if necessary, using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.

C. All non-porous substrates such as ceramic tile, terrazzo, etc., must be well bonded, clean and free of wax, dressings and sealers. If necessary, have the surface professionally cleaned.

D. All cracks in the subfloor shall be repaired to minimize telegraphing through the underlayment.

E. Substrates shall be tested and corrected for moisture and for any other condition, which could affect the performance of the underlayment and the finish floor covering, before installing the patch.

F. All concrete subfloors and concrete floors with existing patching must be solid, sound, solid, thoroughly cleaned, and properly primed.
   1. All concrete subfloors must be of adequate strength, clean, and free of all oil, grease, dirt, curing compounds and any substance, which might act as a bondbreaker. Mechanically clean, if necessary, using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.

   2. All cracks in the subfloor shall be repaired to minimize telegraphing into the underlayment.

3. Subfloors shall be inspected and corrected for moisture or any other conditions which could affect the performance of the underlayment or finished floor covering.

G. Priming
   1. No primer required for porous concrete floors.

   2. Primer for non-porous substrates.

   3. Prime with ARDEX P-82 Ultra Prime. Mix Part A (red) and Part B (white) and apply evenly with a short-nap or foam paint roller, leaving a thin coat of primer no heavier than a thin coat of paint. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, slightly tacky film (min. 3 hours, max. 24 hours). Underlayment shall not be applied until primer is dry.

   4. Primer coverage approximately 200 to 400 square feet per gallon.

H. Priming ARDEX LU-100 Priming
   1. Extremely absorbent substrates

      i. Mix ARDEX P-51 3:1 with water and apply evenly with a soft pushbroom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, thin film (One to three hours). Second coat of Primer shall not be applied until initial primer application is completely dry.

      ii. Mix ARDEX P-51 1:1 with water and apply evenly with a soft pushbroom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, thin film (minimum 3 hours, maximum 24 hours). ARDEX LU- 100 Underlayment shall not be installed until second primer application is completely dry.
   2. Non-water soluble adhesive residues – Use ARDEX P 51 PRIMER at full strength and install as above.

   3. Non-porous substrates: Prime with ARDEX P 82 ULTRA PRIME. Mix Part A (red) with Part B (white) and apply with a short-nap or sponge paint roller, leaving a thin coat of primer no heavier than a thin coat of paint. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, slightly tack film (minimum 3 hours, maximum 24 hours). Underlayment shall not be installed until primer is dry. Primer coverage is approximately 200 to 400 square feet per gallon.

3.02 APPLICATION OF UNDERLAYMENT

A. Pour or pump the ARDEX LU-100 and spread with the ARDEX T-4 Spreader. Use the ARDEX T-5 Smoother for featheredge and touch-up. Wear baseball shoes with nonmetallic cleats to avoid leaving marks in the ARDEX LU-100. Underlayment can be carefully walked on in 3 hours at 70°F.

3.03 PREPARATION FOR FLOORING INSTALLATION

A. Underlayment can accept finish floor covering materials after 2-3 days at 70°F/50% R.H. depending upon thickness. Perform a moisture test in accordance with ASTM D4263 before installing the finish flooring.

3.04 FIELD QUALITY CONTROL

A. Where specified, field sampling of the Ardex topping is to be done by taking an entire unopened bag of the product being installed to an independent testing facility to perform compressive strength testing in accordance with ASTM C 109/modified: air-cure only. There are no in situ test procedures for the evaluation of compressive strength.

3.05 PROTECTION

A. Prior to the installation of the finish topping, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, Masonite or other suitable protection course.

END OF SECTION 035400

SECTION 035416 – CEMENT-BASED, INTERIOR, SELF LEVELING UNDERLAYMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. Cement-based, interior, self-leveling underlayment.

1.03 SECTION INCLUDES

A. Cement-based, interior, self-leveling underlayment used to create a smooth, flat or level surface prior to the installation of floor coverings.

1. Cement-based, interior, self-leveling underlayment

2. Primer

3. Vapor mitigation product

4. Fiber reinforcement material

5. Finishing underlayment compound

B. Related Sections include the following:

1. Section 033000, Cast-In-Place Concrete

2. Division 09 Flooring Sections

1.04 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with all applicable requirements and standards.

D. ASTM C109M, Compressive Strength Air-Cure Only

E. ASTM C348, Flexural Strength of Hydraulic Cement Mortars

F. ASTM C190, Method of Test for Tensile Strength of Hydraulic Cement Mortars

G. ASTM C1583, Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension

H. ASTM C4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

I. ASTM F2170, Relative Humidity in Concrete Floor Slabs Using in situ Probes

J. ASTM F1869, Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

K. ASTM 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

L. Resilient Floor Covering Institute booklet “Recommended Work Practices for the Removal of Resilient Floor Coverings”

1.05 QUALITY ASSURANCE

A. Installation of CMP SPECIALTY PRODUCTS LEVEL-1 must be by a trained applicator regularly engaged and properly equipped for application of concrete floor underlayment. Please contact your local CMP SPECIALTY PRODUCTS distributor for a list of Installers.

B. Product shall be able to be installed from ¼ inch to 3 inches thickness neat and up to 5-inches properly extended with aggregate over well-defined areas.

C. Product shall be formulated to develop a compressive strength of 5000 psi when tested in accordance with ASTM C109/modified for air-cured conditions.

D. Product shall be able to be covered by thinset ceramic tile in 24 hours, water-based sealers and adhesives for standard coverings in 48 hours, epoxy or urethane adhesives and moisture sensitive coverings in 3 to 5 days. For application of epoxy coatings < 20 mils: 24 hours and high build epoxy coatings > 20 mils: 5 to 7 Days. Always ensure underlayment is totally dry especially when using moisture sensitive adhesive and floor coverings.

E. Product produces a hard-durable surface that can be left open to normal construction traffic for up to one year before the installation of finished flooring. CMP SPECIALTY PRODUCTS LEVEL-1 can be feather edged to meet existing transitions.

1.06 SUBMITTALS

A. Product Data: Product data in the form of technical data, specifications, and installation instructions.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original undamaged packages or acceptable bulk containers.

B. Store packaged materials to protect them from elements or physical damage.

C. Do not use which shows indications of moisture damage, caking, or other signs of deterioration.

1.08 PROJECT CONDITIONS

A. Do not place the product when ambient temperature is below 50 degrees F (10 degrees C) or above 95 degrees F (35 degrees C).

PART 2 – PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MATERIALS

A. Self-Leveling Underlayment: Free-flowing, self-leveling, pumpable, cement-based compound for applications from 1/4 inch to 3 inches. Applications up to 5 inches in thickness properly extended with aggregate.

BASIS OF DESIGN

1. CMP SPECIALTY PRODUCTS “LEVEL-1”

a. Flow Working Time: 25 minutes

b. Final Set: Approximately 90 minutes, ASTM C191

c. Compressive Strength:

i. 1500 psi at 1 day, ASTM C109M

ii. 3000 psi at 7 days, ASTM C109M

iii. 5000 psi at 28 days, ASTM C109M

d. Flexural Strength: 1000 psi at 28 days, ASTM 348

e. Tensile Strength: 520 psi at 28 days, ASTM C190

f. VOC: 0g/L, calculated SCAQMD 1168

2. Architect Approved Equal

B. Underlayment Primer: Premium primer designed for use with CMP’s line of underlayments and toppings.

1. CMP SPECIALTY PRODUCTS “AS-100”

2. CMP SPECIALTY PRODUCTS “LOCKDOWN” with sand broadcast. Note: CMP SPECIALTY PRODUCTS LOCK DOWN with sand broadcast is required for applications subject to dynamic rolling loads and when CMP SPECIALTY PRODUCTS LEVEL-1 is used as a prefill for CMP SPECIALTY PRODUCTS DIAMOND CAP installations.

C. Vapor Mitigation and Remediation Product: 100% solids, two-component, resin based, membrane forming, moisture mitigation system.

1. CMP SPECIALTY PRODUCTS “LOCKDOWN”

D. Redispersible Fiber Mat: Fiber reinforcement mat for use with wood, unstable and distressed subfloors.

1. CMP SPECIALTY PRODUCTS “MEDIMAT”

E. Finishing Underlayment Compound: Trowelable, cement-based smoothing compound for applications from feather edge to ½ inch thick.

1. CMP SPECIALTY PRODUCTS “PREPSTAR”

F. Polished, Self Leveling Topping: Calcium Aluminate/Portland cement based self-leveling topping for applications from 1/4 inch to 2 inches thickness and suitable to receive a mechanical concrete polish process.

1. CMP SPECIALTY PRODUCTS DIAMOND CAP

G. Self Leveling Topping: Premium free-flowing, self-leveling, pumpable, calcium aluminate/ Portland cement-based compound for applications from 1/8 inch to 1/2 inch thickness.

1. CMP SPECIALTY PRODUCTS LIQUICEM

H. Aggregate: For extension on CMP SPECIALTY PRODUCTS LEVEL-1 in 3 inch to 5 inch thick applications.

2.03 MIXING EQUIPMENT

A. Provide suitable batch type mechanical mixer for mixing topping material at the Project Site. Equip batch mixer with a suitable charging hopper, water storage tank, and a water-measuring device. Use only mixers which are capable of mixing aggregates, cement, and water into a uniform mix within specified time, and of discharging mix without segregation.

B. Provide suitable mixing-pump such as m-tec, Duo 2000 which includes dual mixing action and wet material probe for consistent mix water monitoring.

C. Provide a suitable barrel, to mix 2-bag batches of product. Provide a suitable dispensing container for measuring a maximum 5.5 quarts of clean cold water for each bag of product. Provide a heavy duty 1/2” drill (min. 850 rpm) with product mixing wand to mix product to a lump free consistency without entraining excess air.

PART 3 - EXECUTION

3.01 PREPARATION (BASIS OF DESIGN PRODUCT)

A. Concrete subfloors: Prepare substrate in accordance with CMP SPECIALTY PRODUCTS’ instructions.

1. Refer to ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring before proceeding.

2. Concrete subfloors must be sound, clean and free of all dirt, oil, grease, laitance, curing compounds and any substance that may act as a bond breaker. If necessary, mechanically clean and remove contaminants by chipping, shot-blasting, grinding or scarifying. Removal with solvents, strippers and acid etching are not acceptable.

3. All cracks in the subfloor must be repaired or treated to minimize crack telegraphing through the underlayment/topping. Moving cracks, working cracks, expansion joints and isolation joints must be honored through the applied CMP SPECIALTY PRODUCTS LEVEL-1.

4. Substrates shall be inspected and tested for moisture in accordance with ASTM F1869 and/or ASTM 2170. Substrates must be corrected for moisture or any other conditions that could affect the underlayment/topping performance or finished floor covering. Utilize CMP SPECIALTY PRODUCTS LOCKDOWN topical moisture vapor mitigation system where moisture and vapor emissions exceed the floor covering manufacturer's required limits.

B. Wooden subfloors: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat.

1. Must be a minimum of ¾ inch, untreated, APA Rated, Type-1, exterior grade plywood, OSB or equal. The subfloor must be free of deflection (L/360 maximum) considering both live and dead loads. Subfloor must be clean, sound and free of all foreign matter that will inhibit bond.

2. Prepare by sanding down to bare wood. Secure loose boards with deck screws and fill open seams with CMP SPECIALTY PRODUCTS PREPSTAR. Replace any weak or water damaged wood.

3. Use an approved anti-fracture membrane over CMP SPECIALTY PRODUCTS LEVEL-1 in areas where Ceramic Tile or Stone are being installed.

C. Non-Porous floors: Epoxy, Terrazzo, and ceramic and quarry tile must be abraded to a dull finish. Vacuum or wet vacuum the surface to remove dust and laitance.

D. Adhesive residue: Thin, translucent adhesive residue must be non-water soluble, free of tack and well bonded to the substrate. The adhesive Cutback must be prepared using the wet scrape method as outlined in the Resilient Floor Covering Institute booklet "Recommended Work Practices for the Removal of Resilient Floor Coverings". Remove all patching materials below the adhesive and avoid applications where heat or excessive moisture will soften or degrade the adhesive. If unsure about the suitability, deflection or if heavy loads are expected, use the VERY DISTRESSED SUBFLOORS Application Method below.

E. Very distressed subfloors: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat for use with wood, unstable and distressed subfloors.

1. ALL substrates must be clean, dry, between 50˚ and 95˚F (10˚ and 30˚C) and free of oil, loose (floorcovering, patching compounds or surface material). Remaining materials must be unaffected by the moisture incurred from the placement of self-leveling. Never use Acid or Mastic Removers on any surface to which a CMP product will be applied.

F. Gypsum substrates: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat.

1. Remove all loose debris from subfloor. Sweep and vacuum the substrate.

G. Metal substrates: Substrate must be prepared by abrasive cleaning to a White metal finish, structurally sound and free of deflection (L/360 maximum). Remove all residue using a dry cleaning method or wipe down with Xylene.

3.02 INSTALLATION (BASIS OF DESIGN PRODUCT)

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with CMP SPECIALTY PRODUCTS published recommendations.

C. Concrete subfloors: Apply one coat of CMP SPECIALTY PRODUCTS AS-100 diluted 50/50 (1 part water: 1 part CMP SPECIALTY PRODUCTS AS-100) using a split tip broom. Pour out and work into surface leaving no puddles or bare spots. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 1 hour) and up to 24 hours. If primer has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.

D. Wooden subfloors: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat.

1. Apply one thin coat of CMP SPECIALTY PRODUCTS AS-100 (Undiluted) using a 3/8 inch nap roller. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 2 hours) and up to 24 hours. If CMP SPECIALTY PRODUCTS AS-100 has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.

2. Roll out CMP SPECIALTY PRODUCTS MEDIMAT over the properly prepared and primed surface. Overlap all seams a minimum of 1 inch and cut to fit using scissors. A single layer of CMP SPECIALTY PRODUCTS MEDIMAT can be used to reinforce CMP SPECIALTY PRODUCTS LEVEL-1 applications up to 1 inch thick. Place an additional layer of mat for thicknesses up to 2”. Mat installation does not need to be “Wrinkle Free” as the product breaks down into individual fibers after the CMP SPECIALTY PRODUCTS LEVEL-1 is placed.

3. Place a minimum of ½ inch of CMP SPECIALTY PRODUCTS LEVEL-1 over CMP SPECIALTY PRODUCTS MEDIMAT.

4. Once the mat is covered, gauge rake. Working the underlayment in a crosshatch pattern with a CMP SPECIALTY PRODUCTS Porcupine or Agitating Roller may be required to properly disperse the fiber; fibers should be visible in the CMP SPECIALTY PRODUCTS LEVEL-1. Pouring or pumping the self-leveling back into already placed material will help in dispersing the fibers.

5. Finish with a CMP SPECIALTY PRODUCTS smoother.

6. Depending on the sensitivity of finished covering, sanding or skim coating using CMP SPECIALTY PRODUCTS PREPSTAR trowelable underlayment or capping with CMP SPECIALTY PRODUCTS LEVEL-1 or CMP SPECIALTY PRODUCTS LIQUICEM may be required to suppress any residual fiber texture remaining in the CMP SPECIALTY PRODUCTS LEVEL-1.

E. Non-Porous floors: Apply one thin coat of CMP SPECIALTY PRODUCTS AS-100 (Undiluted) using a ¼ inch nap roller. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 1 hour) and up to 24 hours. If CMP SPECIALTY PRODUCTS AS-100 has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.

F. Adhesive residue: Apply one thin coat of CMP SPECIALTY PRODUCTS AS-100 (Undiluted) using a 3/8 inch nap roller. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 2 hours) and up to 24 hours. If CMP SPECIALTY PRODUCTS AS-100 has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.

G. Very distressed subfloors: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat.

1. Apply one thin coat of CMP SPECIALTY PRODUCTS AS-100 (Undiluted) using a 3/8 inch nap roller. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 2 hours) and up to 24 hours. If CMP SPECIALTY PRODUCTS AS-100 has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.

2. Roll out CMP SPECIALTY PRODUCTS MEDIMAT™ over the properly prepared and primed surface. Overlap all seams a minimum of 1 inch and cut to fit using scissors. A single layer of CMP SPECIALTY PRODUCTS MEDIMAT™ can be used to reinforce CMP SPECIALTY PRODUCTS LEVEL-1 applications up to 1 inch thick. Place an additional layer of mat for thicknesses up to 2 inches. Mat installation does not need to be “Wrinkle Free” as the product breaks down into individual fibers after the CMP SPECIALTY PRODUCTS LEVEL-1 is placed.

3. Place a minimum of ½ inch of CMP SPECIALTY PRODUCTS LEVEL-1 over CMP SPECIALTY PRODUCTS MEDIMAT.

4. Once the mat is covered, gauge rake. Working the underlayment in a crosshatch pattern with a CMP SPECIALTY PRODUCTS Porcupine or Agitating Roller may be required to properly disperse the fiber; fibers should be visible in the CMP SPECIALTY PRODUCTS LEVEL-1. Pouring or pumping the self-leveling back into already placed material will help in dispersing the fibers.

5. Finish with a CMP SPECIALTY PRODUCTS smoother.

6. Depending on the sensitivity of finished covering, sanding or skim coating using CMP SPECIALTY PRODUCTS PREPSTAR trowelable underlayment or capping with CMP SPECIALTY PRODUCTS LEVEL-1 or CMP SPECIALTY PRODUCTS LIQUICEM may be required to suppress any residual fiber texture remaining in the CMP SPECIALTY PRODUCTS LEVEL-1.

H. Gypsum substrates: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT redispersible fiber reinforcement mat.

1. The first primer coat should be diluted and applied at 1 part CMP SPECIALTY PRODUCTS AS-100: 3 parts water using a split tip Broom. Pour out and work into surface leaving no puddles or bare spots.

2. After initial coat is dry (Minimum 1 hour) apply the second coat of CMP SPECIALTY PRODUCTS AS-100 diluted 50/50 (1 part water: 1 part CMP SPECIALTY PRODUCTS AS-100) using a split tip broom. Pour out and work into surface leaving no puddles or bare spots.

3. Install CMP SPECIALTY PRODUCTS MEDIMAT™ as per TDS once CMP SPECIALTY PRODUCTS AS-100 is completely dry (Minimum 2 hours) and up to 24 hours. If Primer has dried longer than 24 hours, an additional coat of CMP SPECIALTY PRODUCTS AS-100 may be required.

4. Roll out CMP SPECIALTY PRODUCTS MEDIMAT™ over the properly prepared and primed surface. Overlap all seams a minimum of 1 inch and cut to fit using scissors. A single layer of CMP SPECIALTY PRODUCTS MEDIMAT™ can be used to reinforce CMP SPECIALTY PRODUCTS LEVEL-1 applications up to 1 inch thick. Place an additional layer of mat for thicknesses up to 2 inches. Mat installation does not need to be “Wrinkle Free” as the product breaks down into individual fibers after the CMP SPECIALTY PRODUCTS LEVEL-1 is placed.

5. Place a minimum of ½ inch of CMP SPECIALTY PRODUCTS LEVEL-1 over CMP SPECIALTY PRODUCTS MEDIMAT.

6. Once the mat is covered, gauge rake. Working the underlayment in a crosshatch pattern with a CMP SPECIALTY PRODUCTS Porcupine or Agitating Roller may be required to properly disperse the fiber; fibers should be visible in the CMP SPECIALTY PRODUCTS LEVEL-1. Pouring or pumping the self-leveling back into already placed material will help in dispersing the fibers.

7. Finish with a CMP SPECIALTY PRODUCTS smoother.

8. Depending on the sensitivity of finished covering, sanding or skim coating using CMP SPECIALTY PRODUCTS PREPSTAR trowelable underlayment or capping with CMP SPECIALTY PRODUCTS LEVEL-1 or CMP SPECIALTY PRODUCTS LIQUICEM may be required to suppress any residual fiber texture remaining in the CMP SPECIALTY PRODUCTS LEVEL-1.

3.03 MIXING (BASIS OF DESIGN PRODUCT)

A. Use CMP SPECIALTY PRODUCTS mixing drum, to mix 2-bag batches of CMP SPECIALTY PRODUCTS LEVEL-1. Add a maximum 5.5 quarts of clean cold water for each bag of CMP SPECIALTY PRODUCTS LEVEL-1 to the mixing drum or barrel. Then, add bags of CMP SPECIALTY PRODUCTS LEVEL-1 while mixing at full speed with a CMP SPECIALTY PRODUCTS mixing wand attached to a heavy duty ½ inch drill (min. 850 rpm). Mix for 2 minutes or until lump free. Add no additional water and keep the mixing wand immersed in the material to avoid entraining excess air.

B. Aggregate mix: For installation areas over 2 inches (5 cm) in thickness, up to 1 part by volume of well graded, washed pea gravel must be added. Aggregates should be hard, high density and non-absorbent. Before attempting to use any aggregate, conduct testing to determine suitability. All aggregate should be clean and dry. Do not use sand or exceed 1 part aggregate by volume. Combine aggregate once material is lump free and mix until aggregate is completely coated. Aggregate addition will diminish workability and

may make it necessary to install a finish layer. Allow the first installation to dry 12 to 16 hours before topping.

C. For pump installations, please contact CMP SPECIALTY PRODUCTS for instructions, recommended pumping procedures and approved equipment.

3.04 PLACING (BASIS OF DESIGN PRODUCT)

A. Place underlayment in accordance with CMP SPECIALTY PRODUCTS' instructions, using equipment and procedures to facilitate continuous placement, avoid segregation of mix and prevent excessive air content. Pour or pump, gauge rake with a CMP SPECIALTY PRODUCTS gauge rake and smooth with a CMP SPECIALTY PRODUCTS smoother in a continuous operation until an entire panel or section of floor area are completed. Do not work mix except for raking or smoothing.

3.05 CURING AND PROTECTION (BASIS OF DESIGN PRODUCT)

A. Cure and protect CMP SPECIALTY PRODUCTS LEVEL-1 underlayment/topping applications and finishes as specified CMP SPECIALTY PRODUCTS. CMP SPECIALTY PRODUCTS LEVEL-1 is self-curing. Do not use cure & seals or any other curing methods.

B. During application and for the first 24 hours, prevent excessive air movement but maintain adequate ventilation and protect material from direct sunlight to prevent uneven curing patterns, false set and cracking.

3.06 PERFORMANCES (BASIS OF DESIGN PRODUCT)

A. Failure of CMP SPECIALTY PRODUCTS LEVEL-1 to bond to substrate, or disintegration or other failure of topping to perform as a floor underlayment or topping compound will be considered failure of materials and/or workmanship. Repair or replace CMP SPECIALTY PRODUCTS LEVEL-1 in areas of such failures, as directed by CMP SPECIALTY PRODUCTS.

END OF SECTION 035416