ADDENDUM NO. 1

December 8, 2021

Northglade Montessori Magnet School Remodel & Site Improvements

Northglade Montessori Magnet School
1914 Cobb Avenue
Kalamazoo, MI, 49007

TO: ALL BIDDERS OF RECORD

****BIDS DUE TIME CHANGED TO 3:00 PM****

This Addendum forms a part of and modifies the Bidding Requirements, Contract Forms, Contract Conditions, the Specifications, and the Drawings dated November 1, 2021, by TowerPinkster. Acknowledge receipt of the Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

This Addendum consists of Pages ADD 1-1 through ADD 1-2, dated December 8, 2021, and TowerPinkster Addendum No. 1 dated December 6, 2021, consisting of 2 pages, Issued Specification 26 36 00, and Reissued Specification 32 13 13.

A. SPECIFICATION SECTION 00 00 10 – TITLE PAGE

1. All references to the **Bids Due** are to change from 2:00 pm (local time), to **3:00 pm** (local time), and bids will be publicly read aloud immediately following the deadline.

B. SPECIFICATION SECTION 00 02 00 – NOTICE TO BIDDERS

1. All references to the **Bids Due** are to change from 2:00 pm (local time), to **3:00 pm** (local time), and bids will be publicly read aloud immediately following the deadline.

C. SPECIFICATION SECTION 00 31 00 – BID FORM

1. Replace with attached revised Bid Form. **NOTE REVISED DESCRIPTION FOR ALTERNATES AND NEW ALTERNATE NO. 3.**

D. SPECIFICATION SECTION 01 12 00b – MULTIPLE CONTRACT SUMMARY

Part 3.03 Bid Categories

A. BID CATEGORY NO. 1 GENERAL TRADES

1. Add the following Clarification:

No. 13: At all new interior signage locations of replacement, provide removal, disposal of existing sign, clean, prime and paint the surface to match existing surface at all sign mounted locations and prep for new installation.

B. BID CATEGORY NO. 2 ASPHALT PAVING

1. Add the following Clarification:

No. 3: Provide all work associated with removal, disposal, and installation of 300 square feet of new concrete walkaways/sidewalks as part of the base-bid at the discretion of Construction Manager. *This 300 square feet of existing concrete work is anticipated to be damaged while accessing the back asphalt (playground area) replacement.*

C. BID CATEGORY NO. 7 – ELECTRICAL

1. Add the following specification section:

Section 26 36 00 Automatic Transfer Switches

E. SPECIFICATION SECTION 01 23 00 – ALTERNATES

1.04 Add the following Alternate:

F. ALTERNATE NO. 3: Provide roofing of Areas 1, 2, 3, and 4 in alternative construction schedule starting in April 2022 through end of September 2022.

F. SPECIFICATION SECTION 01 32 00 – SCHEDULES AND REPORTS

1. Issued new Guideline Construction Schedule.
2. Issued new Site Logistics Plan.
3. Pre-award Conference Schedule.

End of Addendum

(Amended for KPS)

CONTRACTOR'S BID FOR PUBLIC WORKS

Northglade Montessori Magnet School
Remodel & Site Improvements

Kalamazoo Public Schools

Kalamazoo County

PART I

(To be completed for all bids)
(Please type or print)

BIDDER (firm) _____

Address _____ P.O. Box _____

City/State/Zip _____
Telephone Number _____ Email Address: _____
Person to contact regarding this Bid: _____
Pursuant to notices given, the undersigned offers to furnish labor and materials necessary to complete the construction work for:

_____
Insert Bid Category No.(s) and Name(s)

of public works project, **Northglade Montessori Magnet School Remodel & Site Improvements**, in accordance with Plans and Specifications prepared by **TowerPinkster**, **242 E. Kalamazoo Avenue, Suite 100, Kalamazoo, MI 49007**, as follows:

BASE BID

For the sum of _____
(sum in words)

_____DOLLARS ($_____)
(sum in figures)

The undersigned acknowledges receipt of the following Addenda:

Receipt of Addenda No.(s)_____

PROPOSAL TIME

Bidder agrees that this Bid shall remain in force for a period of sixty (60) consecutive calendar days from the due date, and Bids may be accepted or rejected during this period. Bids not accepted within said sixty (60) consecutive calendar days shall be deemed rejected.

Attended pre-bid conference YES _____ NO

Has visited the jobsite YES _____ NO

The Bidder must attach to this bid, the sworn and notarized affidavit (attached at the end of this Bid Form) disclosing any familial relationship between the Owner or an employee of the bidder and any member of the District's Board or the Superintendent of the District.

The Bidder has reviewed the Guideline Schedule in Section 01 32 00 and the intent of the schedule can be met. _____ YES _____ NO

The Skillman Corporation's diversity initiative is to create a program to encourage, assist and measure the active participation of Minority- Owned, Women-Owned, Veteran – Owned and Disabled Individual-Owned Businesses. The Program is to ensure that MWVDBEs are provided full and equal opportunity to participate in all Skillman Corporation's Projects.

Bidder has included:

DBE: YES _____% NO _____
MBE: YES _____% NO _____
WBE: YES _____% NO _____
VBE: YES _____% NO _____

The undersigned further agrees to furnish a bond or certified check with this Bid for an amount specified in the Notice to Bidders. If Alternate Bids apply, submit a proposal for each in accordance with the Plans and Specifications.

ALTERNATE BIDS

A blank entry or an entry of "No Bid", "N/A", or similar entry on any Alternate will cause the bid to be rejected as non-responsive only if that Alternate is selected. If no change in the bid amount is required, indicate "No Change".

****MARK "ADD" OR "DEDUCT" FOR EACH ALTERNATE****

Alternate Bid No. 1 – Doors labeled as Alternate No. 1 on drawings are to be replaced as part of this alternate.

Change the Base Bid the sum of _____
(sum in words)

_____ DOLLARS ($_____) ADD / DEDUCT
(sum in figures)

Alternate Bid No. 2A – Roofing Alternate: Complete roofing scope for area 1 as outlined in drawing A103.

Change the Base Bid the sum of _____
(sum in words)

_____ DOLLARS($ _____) ADD / DEDUCT
(sum in figures)

Alternate Bid No. 2B – Roofing Alternate: Complete roofing scope for area 2 as outlined in drawing A103.

Change the Base Bid the sum of _____
(sum in words)

_____ DOLLARS($ _____) ADD / DEDUCT
(sum in figures)

Alternate Bid No. 2C – Roofing Alternate: Complete roofing scope for area 3 as outlined in drawing A103.

Change the Base Bid the sum of _____
(sum in words)

_____ DOLLARS($ _____) ADD / DEDUCT
(sum in figures)

Alternate Bid No. 2D – Roofing Alternate: Complete roofing scope for area 4 as outlined in drawing A103.

Change the Base Bid the sum of _____
(sum in words)

ADD

_____DOLLARS($ _____) DEDUCT
(sum in figures)

Alternate Bid No. 3 – Provide roofing of Areas 1, 2, 3, and 4 in alternative construction schedule starting in April 2022 through end of September 2022.

Change the Base Bid the sum of _____
(sum in words)

ADD
_____DOLLARS($ _____) DEDUCT
(sum in figures)

Unit Prices

A. Unit Price No. 1: Supplemental Excavation, Satisfactory Soil Fill:

1. Description: Unit price for the removal of unforeseen unsatisfactory soil and replacement with satisfactory soil, according to Section 31 2000 "Earth Moving."
_____DOLLARS($ _____)
(sum in figures)

2. Unit of Measurement: Cubic yard of soil excavated, based on in-place surveys of volume before and after removal.

_____DOLLARS($ _____)
(sum in figures)

B. Unit Price No. 2: Supplemental Excavation, Engineered Fill:

1. Description: Unit price for the removal of unforeseen unsatisfactory soil and replacement with engineered fill, according to Section 31 2000 "Earth Moving."

_____DOLLARS($ _____)
(sum in figures)

2. Unit of Measurement: Cubic yard of soil excavated, based on in-place surveys of volume before and after removal.

_____DOLLARS($ _____)
(sum in figures)

NON-COLLUSION AFFIDAVIT

The undersigned Bidder or agent, being duly sworn on oath, says that he has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to induce anyone to refrain from bidding, and that this Bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He further says that no person or persons, firms, or corporations has, have, or will receive directly or indirectly, any rebate, fee, gift, commission, or thing of value on account of such sale.

OATH AND AFFIRMATION

I affirm under the penalties of perjury that the foregoing facts and information are true and correct to the best of my knowledge and belief.

Dated at _____this _____ day of _____, 20___.

_____
(Name of Organization)

By _____
(Title of Person Signing)

ACKNOWLEDGEMENT

STATE OF_____)
) SS:
COUNTY OF _____)

_____ being duly sworn, deposes and says that

he is _____of the above _____
(Title) (Name of Organization)

and that the statements contained in the foregoing Bid, certification and Affidavit are true and correct.

Subscribed and sworn to before me this _____ day of _____ , 20 ___ .

_____
Notary Public

My Commission Expires:_____

County of Residence: _____

PART II

(Complete sections I, II, and III for all state and local public works projects)

These statements to be submitted under oath by each bidder with and as a part of his bid. (Attach additional pages for each section as needed.)

SECTION I EXPERIENCE QUESTIONNAIRE

1. What public works projects has your organization completed?

Contract Amount	Class of Work	When Completed	Name and Address of Owner

2. What public works projects has your organization now in process of construction:

Contract Amount	Class of Work	When Completed	Name and Address of Owner

3. Have you ever failed to complete any work awarded to you?_____If so, where and why?_____

_____

_____

4. List references from private firms for which you have performed work.

_____

_____

_____

SECTION II PLAN AND EQUIPMENT QUESTIONNAIRE

1. Explain your plan or layout for performing proposed Work.

2. If you intend to sublet any portion of the Work, state the name and address of each subcontractor, equipment to be used by the subcontractor, and whether you expect to require a bond.

3. What equipment do you intend to use for the proposed Project?

4. Have you made contracts or received offers for all materials within prices used in preparing your proposal? _____ yes _____ no.

SECTION III OATH AND AFFIRMATION

I hereby affirm under the penalties of perjury that the facts and information contained in the foregoing Bid for public works are true and correct to the best of my knowledge and belief.

IN TESTIMONY WHEREOF, The Bidder has hereunto set his hand this

_____ day of _____ , 20 _____ .

Bidder:_____

IN TESTIMONY WHEREOF, The Bidder (a firm) have hereunto set their hands this

_____ day of _____, 20_____.

Firm Name: _____

By:_____

Individual names:_____

IN TESTIMONY WHEREOF, The Bidder (a corporation) has caused this proposal to be signed by its President and Secretary and affixed its corporate seal this_____ day of _____ , 20 _____.
Name of Corporation:

President: _____
Secretary:_____

ACKNOWLEDGEMENT

STATE OF_____)
) SS:
COUNTY OF_____)

_____ being duly sworn, deposes and says that

he is _____ of the above _____
(Title) (Name of Organization)

and that the answers to the questions in the foregoing questionnaires and all statements therein contained are true and correct.

Subscribed and sworn to before me this_____ day of _____, 20 ___.

_____
Notary Public

My Commission Expires: _____
County of Residence: _____

KALAMAZOO PUBLIC SCHOOLS
FAMILIAL STATEMENT OF DISCLOSURE

***** Failure to return this notarized statement/signature with the bid will result in bid disqualification *****

Kalamazoo Public Schools
600 Vine Street
Kalamazoo, MI 49008

Dear Ladies and Gentlemen:

I/We, the undersigned, acknowledge by this sworn and notarized statement disclosing any familial relationship (or lack of a relationship) that exists between the Owner or any employee of the bidder and any member of the Board of Education of the Kalamazoo Public Schools or the Superintendent of the School District. The District shall not accept a bid that does not include a sworn and notarized disclosure statement.

○ We have prior familial knowledge of parties' involved (Attached clarification).

○ We have no prior familial knowledge of parties involved.

_____
Signature

_____
Company Name

_____
Notary Public

_____County, Michigan

My Commission Expires:_____

CERTIFICATION OF COMPLIANCE – IRAN ECONOMIC SANCTIONS ACT
Michigan Public Act No. 517 of 2012

The undersigned, the owner, or authorized officer of the below-named company (the "Company"), pursuant to the compliance certification requirement provided in the **Kalamazoo Public School's** Request For Proposal (the "RFP"), hereby certifies, represents, and warrants that the Company (which includes its officers, directors and employees) is not an "Iran Linked Business" within the meaning of the Iran Economic Sanctions Act, Michigan Public Act No. 517 of 2012 (the "Act"), and that in the event the Company is awarded a contract by the **Kalamazoo Public School** as a result of the aforementioned RFP, the Company is not and will not become an "Iran Linked Business" at any time during the course of performing any services under the contract.

The Company further acknowledges that any person who is found to have submitted a false certification is responsible for a civil penalty of not more than $250,000.00 or two (2) times the amount of the contract or proposed contract for which the false certification was made, whichever is greater, the cost of the **Kalamazoo Public Schools's** investigation, and reasonable attorney fees, in addition to the fine. Moreover, any person who submitted a false certification shall be ineligible to bid on a request for proposal for three (3) years from the date that it is determined that the person has submitted the false certification.

BIDDER:

_____

By: _____

Its: _____

STATE OF MICHIGAN)
)ss.
COUNTY OF _____)

This instrument was acknowledged before me on the _____ day of _____, 20__, by _____.

_____
, Notary Public

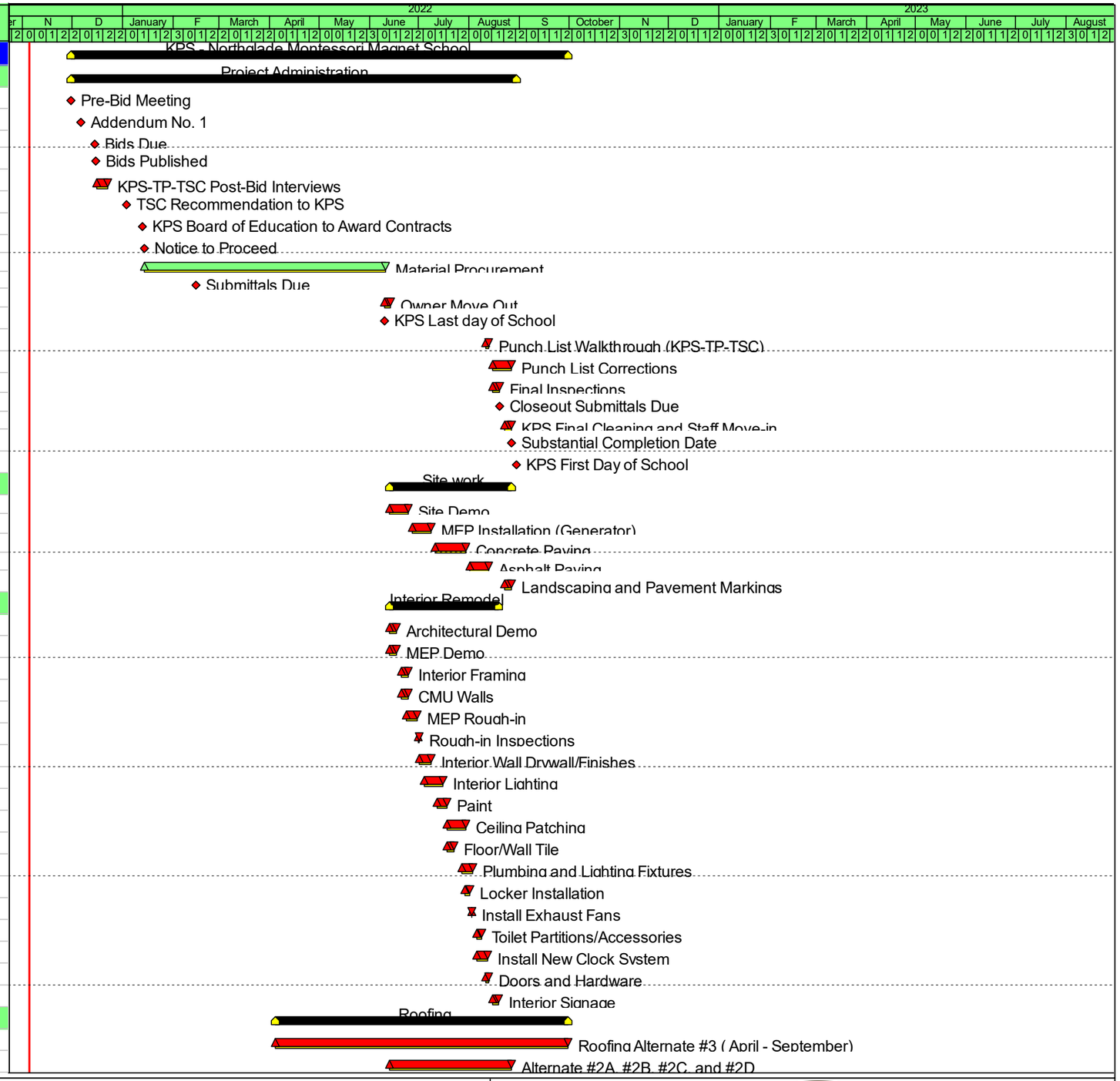
_____ County, Michigan

My Commission Expires: _____

Acting in the County of: _____

END OF SECTION 00 31 00

Activity Name	Original Duration	Start	Finish
KPS - Northglade Montessori Magnet School	219	30-Nov-21	30-Sep-22
Project Administration	195	30-Nov-21	29-Aug-22
Pre-Bid Meeting	0	30-Nov-21	
Addendum No. 1	0		06-Dec-21
Bids Due	0		14-Dec-21
Bids Published	0	15-Dec-21	
KPS-TP-TSC Post-Bid Interviews	5	16-Dec-21	22-Dec-21
TSC Recommendation to KPS	0		03-Jan-22
KPS Board of Education to Award Contracts	0	13-Jan-22	
Notice to Proceed	0	14-Jan-22	
Material Procurement	106	14-Jan-22	10-Jun-22
Submittals Due	0		14-Feb-22
Owner Move Out	2	10-Jun-22	13-Jun-22
KPS Last day of School	0	10-Jun-22	
Punch List Walkthrough (KPS-TP-TSC)	2	11-Aug-22	12-Aug-22
Punch List Corrections	10	15-Aug-22	26-Aug-22
Final Inspections	5	15-Aug-22	19-Aug-22
Closeout Submittals Due	0		19-Aug-22
KPS Final Cleaning and Staff Move-in	5	22-Aug-22	26-Aug-22
Substantial Completion Date	0		26-Aug-22
KPS First Day of School	0		29-Aug-22
Site work	55	13-Jun-22	26-Aug-22
Site Demo	10	13-Jun-22	24-Jun-22
MEP Installation (Generator)	10	27-Jun-22	08-Jul-22
Concrete Paving	15	11-Jul-22	29-Jul-22
Asphalt Paving	10	01-Aug-22	12-Aug-22
Landscaping and Pavement Markings	5	22-Aug-22	26-Aug-22
Interior Remodel	49	13-Jun-22	18-Aug-22
Architectural Demo	5	13-Jun-22*	17-Jun-22
MEP Demo	5	13-Jun-22	17-Jun-22
Interior Framing	5	20-Jun-22	24-Jun-22
CMU Walls	5	20-Jun-22	24-Jun-22
MEP Rough-in	5	23-Jun-22	30-Jun-22
Rough-in Inspections	1	30-Jun-22	01-Jul-22
Interior Wall Drywall/Finishes	5	01-Jul-22	08-Jul-22
Interior Lighting	10	04-Jul-22	15-Jul-22
Paint	5	12-Jul-22	18-Jul-22
Ceiling Patching	10	18-Jul-22	29-Jul-22
Floor/Wall Tile	5	18-Jul-22	22-Jul-22
Plumbing and Lighting Fixtures	5	27-Jul-22	03-Aug-22
Locker Installation	1	29-Jul-22	01-Aug-22
Install Exhaust Fans	1	02-Aug-22	02-Aug-22
Toilet Partitions/Accessories	2	05-Aug-22	08-Aug-22
Install New Clock System	5	05-Aug-22	12-Aug-22
Doors and Hardware	2	11-Aug-22	12-Aug-22
Interior Signage	4	15-Aug-22	18-Aug-22
Roofing	130	04-Apr-22	30-Sep-22
Roofing Alternate #3 (April - September)	130	04-Apr-22	30-Sep-22
Alternate #2A, #2B, #2C, and #2D	55	13-Jun-22	26-Aug-22

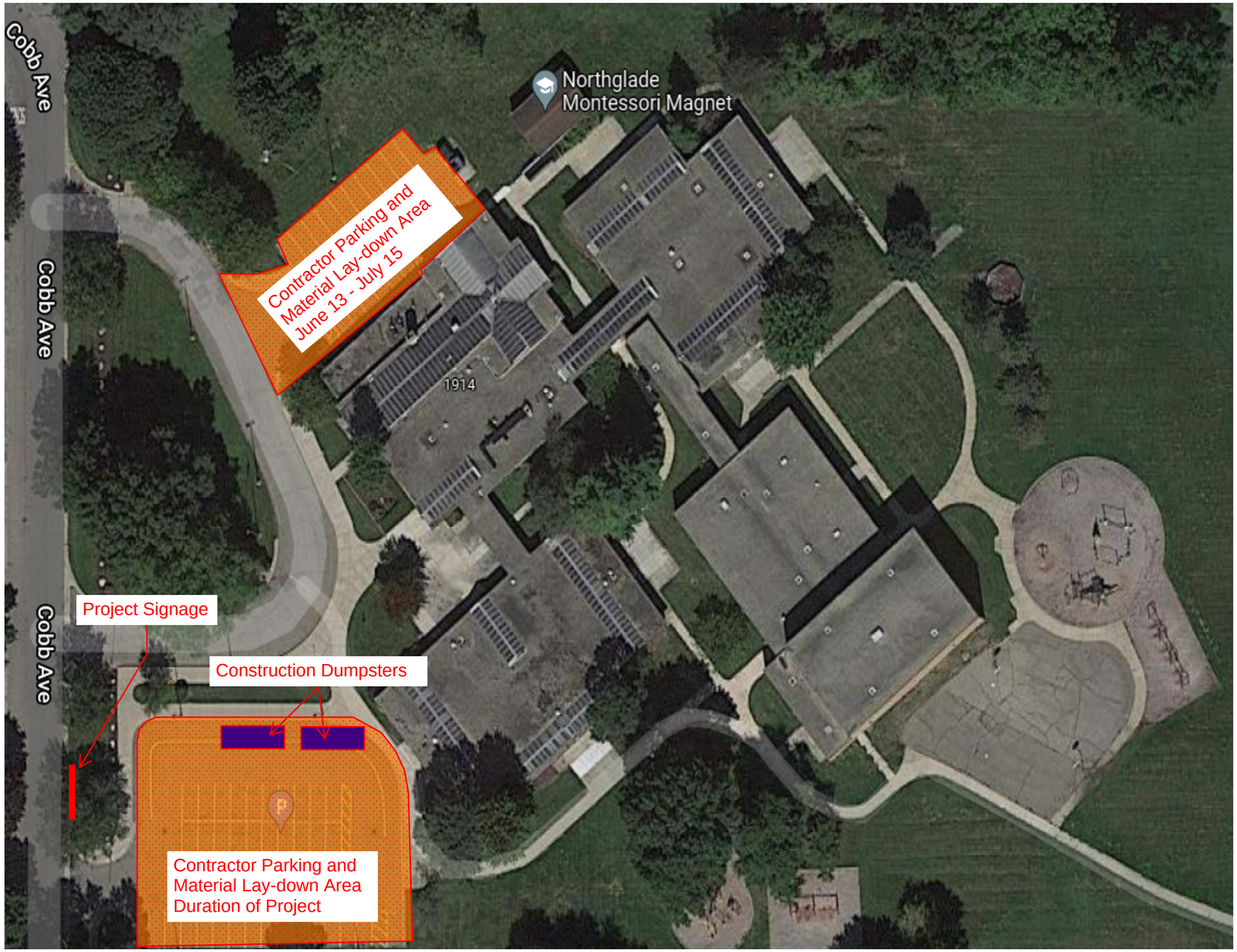


Primary Baseline
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

KPS - Northglade Montessori Magnet School

Guideline Schedule 05-Nov-21

SKILLMAN



Kalamazoo Public Schools

Every child. Every opportunity. Every time.

KPS - Northglade Monstessori Magnet School

Site Logistics Plan - 11.22.2021

SKILLMAN

TowerPinkster

Architecture · Engineering · Interiors

Pre-Award Conference Schedule

12/8/2021

KPS Parkwood, Milwood Elementary and Northglade

Bid Category #/Name:	Project	Contractor:	Time:	Kalamazoo Public Schools	TowerPinkster	Skillman
THURSDAY DECEMBER 16						
FLOORING	MILWOOD ELEM.		8:30 - 9	Karen Jackson	Mike Galovan	Rohit Tilekar
FLOORING	NORTHGLADE		9:15 - 10	Karen Jackson	Mike Galovan	Rohit Tilekar
ROOFING	NORTHGLADE		10 - 10:45	Karen Jackson	Mike Galovan	Rohit Tilekar
LOCKERS	NORTHGLADE		11 - 11:30	Karen Jackson	Mike Galovan	Rohit Tilekar
FRIDAY DECEMBER 17						
PLUMBING	PARKWOOD		8:30 - 9	Karen Jackson	Perry / Mike	Rohit Tilekar
MECHANICAL	MILWOOD ELEM.		9:15 - 10	Karen Jackson	Perry / Mike	Rohit Tilekar
MECHANICAL	NORTHGLADE		10 - 10:45	Karen Jackson	Perry / Mike	Rohit Tilekar
ELECTRICAL	PARKWOOD		11 - 11:30	Karen Jackson	LENTZ / MIKE	Rohit Tilekar
ELECTRICAL	NORTHGLADE		11:30 - 12	Karen Jackson	LENTZ / MIKE	Rohit Tilekar
MONDAY DECEMBER 20						
GENERAL TRADES	PARKWOOD		12:30 - 1:30	Karen Jackson	Mike Galovan	Rohit Tilekar
GENERAL TRADES	MILWOOD		1:30 - 2:15	Karen Jackson	Mike Galovan	Rohit Tilekar
GENERAL TRADES	NORTHGLADE		2:15 - 3:15	Karen Jackson	Mike Galovan	Rohit Tilekar
ASPHALT PAVING	NORTHGLADE		3:15 - 3:45	Karen Jackson	Mike Galovan	Rohit Tilekar
ASPHALT PAVING	PARKWOOD		3:45 - 4	Karen Jackson	Mike Galovan	Rohit Tilekar

TowerPinkster
Architecture · Engineering · Interiors

ADDENDUM NO. 1

DATE OF ISSUANCE:	**December 6, 2021**
PROJECT:	**Northglade Montessori Magnet School Remodel & Site Improvements** **1914 Cobb Avenue** **Kalamazoo, MI 49007**
OWNER:	**Kalamazoo Public Schools**
ARCHITECT'S PROJECT NO.:	**18-528.00**
ORIGINAL BID ISSUE DATE:	**November 1, 2021**

SCOPE OF WORK

This Addendum includes changes to, or clarifications of, the original Bidding Documents and any previously issued addenda, and shall be included in the Bid. All of these Addendum items form a part of the Contract Documents. The Bidder shall acknowledge receipt of this Addendum in the appropriate space provided on the Bid Form. Failure to do so may result in disqualification of the Bid.

DOCUMENTS INCLUDED IN THIS ADDENDUM

This Addendum includes **Two (2)** pages of text and the following documents:

- Bidding Documents: **None**
- Contract Conditions: **None**
- Specification Sections: **26-3600, 32-1313**
- Sketches: **None**
- Drawings: **NA**

CHANGES TO PREVIOULSY ISSUED ADDENDA

None.

CHANGES TO BIDDING REQUIREMENTS

None.

CHANGES TO CONTRACT CONDITIONS

None.

CHANGES TO SPECIFICATION

ADD-1 Item No. S-1 - General Commissioning

Omit Specification Section 01 9113 "General Commissioning Requirements", that section will not be applicable to this project.

ADD-1 Item No. S-2 - Concrete Reinforcement

Refer to reissued Specification Section 32 1313. Include Fiber Reinforcement as indicated.

ADD-1 Item No. S-3 - Automatic Transfer Switches (ATS)

Refer to new Specification Section 26 3600 Automatic Transfer Switches.

Contractor shall provide and install new closed transition ATS. Contractor shall install and commission owner provided generator.

CHANGES TO DRAWINGS

ADD-1 Item No. D-1 - Existing Signage Demolition

Refer to Interior Signage Drawings (Not Reissued)

At each new sign location remove and dispose existing sign. Where applicable prep for; cleaning, prime and painting of surface below where the sign was mounted. Paint to match the existing surrounding area. Refer to Interior Signage sheets for all new sign locations.

ADD-1 Item No. D-2 - Keyed Demolition Notes

Refer to drawing sheet AD101 and AD 102 (Not Reissued)

From keyed note 17 eliminate “and prep for new”. Vinyl wall base and existing locker base are to be removed and disposed and prep for new locker base.

END OF ADDENDUM.

SECTION 26 3600 - TRANSFER SWITCHES – Addendum No. 1

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.
2. Bypass/isolation switches.
3. Nonautomatic transfer switches.
4. Dual Purpose Generator / Load Bank Docking Station
5. Generator Docking Station

B. Related Sections include the following:

1. Division 21 Section "Electric-Drive, Centrifugal Fire Pumps" for automatic transfer switches for fire pumps.
2. Division 21 Section "Electric-Drive, Vertical-Turbine Fire Pumps" for automatic transfer switches for fire pumps.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2. Dimensioned Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based.

B. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

C. Source Limitations: Obtain automatic transfer switches, through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with NEMA ICS 1.

F. Comply with NFPA 70.

G. Comply with NFPA 99.

H. Comply with NFPA 110.

I. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Construction Manager and Owner no fewer than ten days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Construction Manager's and Owner's written permission.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.9 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights. Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace transfer switch and auxiliary components that fail in materials of workmanship within specified warranty period. The warranty shall have no deductibles.

1. Warranty Period: Five years from date of Substantial Completion.
2. Warranty to include: parts, labor and travel time for five years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Conventional Transfer Switches:
   a. Caterpillar; Engine Div.
   b. Emerson; ASCO Power Technologies, LP.
   c. Generac Power Systems, Inc.
   d. GE Zenith Controls.
   e. Kohler Power Systems; Generator Division.
   f. Cummins Power Generation; Industrial Business Group.
   g. Trystar
   h. Russelectric, Inc.
   i. Spectrum Detroit Diesel.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
2. When fault-current value is not indicated on transfer switch, meet or exceed the KA fault current rating of upstream panel with “any breaker” fully rated available fault current rating.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

H. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Division 26 Section "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

I. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

D. Signal-before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

E. Automatic Closed-Transition Transfer Switches: Include the following functions and characteristics:

1. Fully automatic make-before-break operation.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Initiation of No-Interruption Transfer: Controlled by phase angle monitor and sensors confirming both sources are present and acceptable.

    a. Initiation occurs without active control of generator set.
    b. Controls ensure closed-transition load transfer closure occurs only when the two sources are within plus or minus 5 electrical degrees, maximum and plus or minus 5 percent maximum voltage difference.

4. Failure of the power source serving the load initiates automatic break-before-make transfer.

F. [

G. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

H. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Provide with Phase angle monitoring between phases, phase rotation sensing and digital fault history display.
5. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
6. Test Switch: Simulate normal-source failure.
7. Switch-Position Pilot Lights: Indicate source to which load is connected.

8. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

9. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
10. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

11. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.

12. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
13. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
14. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4 BYPASS/ISOLATION SWITCHES

A. Comply with requirements for Level 1 equipment per NFPA 110.

B. Description: Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:

1. Means to lock bypass/isolation in the position that isolates transfer switch, with an arrangement that permits complete electrical testing of transfer switch while isolated. While isolated, interlocks prevent transfer-switch operation, except for testing or maintenance.
2. Drawout Arrangement for Transfer Switch: Provides physical separation from live parts and accessibility for testing and maintenance operations.
3. Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or greater than those of associated automatic transfer switch, and with the same phase arrangement and number of poles.

4. Contact temperatures of bypass/isolation switches do not exceed those of automatic transfer-switch contacts when they are carrying rated load.
5. Operability: Constructed so load bypass and transfer-switch isolation can be performed by one person in no more than two operations in 15 seconds or less.
6. Legend: Manufacturer's standard legend for control labels and instruction signs give detailed operating instructions.
7. Maintainability: Fabricate to allow convenient removal of major components from the front without removing other parts or main power conductors.

C. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed copper bus bars, plated at connection points and braced for the indicated available short-circuit current.

2.5 NONAUTOMATIC TRANSFER SWITCHES

A. Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternate Source." Switch shall be capable of transferring load in either direction with either or both sources energized.

B. Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternate Source." In addition, removable manual handle provides quick-make, quick-break manual-switching action. Switch shall be capable of electrically or manually transferring load in either direction with either or both sources energized. Control circuit disconnects from electrical operator during manual operation.

C. Double-Throw Switching Arrangement: Incapable of pauses or intermediate position stops during switching sequence.

D. Nonautomatic Transfer-Switch Accessories:

1. Pilot Lights: Indicate source to which load is connected.
2. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and alternate-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Alternate Source Available."

3. Unassigned Auxiliary Contacts: One set of normally closed contacts for each switch position, rated 10 A at 240-V ac.

2.6 DUAL PURPOSE GENERATOR / LOAD BANK DOCKING STATION

A. Dual purpose docking station shall include two sets of temporary Generator Camloks and one set of lugs. One set, readily accessible, for connection of a temporary load bank feeding into shunt trip breaker. The second set shall feed into Kirk-key interlocked breaker interlocked with permanent generator main circuit breaker so that a portable generator breaker cannot be closed to the load bus while permanent generator breaker is closed.

1. Use Trystar DBDS-6 or equal.

B. Entire package must be listed to ETL or UL 1008 Standards. UL listing of individual components is not acceptable.

C. Enclosures:

1. NEMA 3R rain-tight aluminum enclosure.
   a. Pad-lockable front door shall include a hinged access plate at the bottom for entry of cables from portable generator or load bank. NEMA 3R integrity shall be maintained with access plate open for cable entry.
   b. Front and side through a front access panel shall be accessible for maintenance.
   c. Top, side and bottom through a front access panel shall be accessible for permanent cabling.

D. Phase, Neutral, and Ground Buses:

1. Material: Silver-plated Copper
2. Equipment Ground Bus: bonded to box.
3. Isolated Ground Bus: insulated from box.
4. Ground Bus: 50% of phase size.
5. Neutral Bus: Neutral bus rated 100 percent of phase bus.
6. Round edges on bus.

E. Load bank and portable generator connectors shall be Camlok style mounted on gland plate (male for the portable generator and female for the portable load bank). Male Camloks to be behind door. Female Connection to feed through breaker with Kirk Key interlocked with permanent generator main breaker.

1. Camlok shall be color coded according to system voltage

F. Permanent connections shall be broad range set-screw type, located behind an aluminum barrier.

G. Voltage & Amperage shall be as shown on project one line drawing.

2.7 GENERATOR DOCKING STATION

A. Docking station shall include one set of temporary Generator Camloks and one set of lugs. The connection shall feed into Kirk-key interlocked breaker interlocked with permanent generator main circuit breaker so that a portable generator breaker cannot be closed to the load bus while permanent generator breaker is closed.

1. Use Trystar SBDS3 or equal.

B. Entire package must be listed to ETL or UL 1008 Standards. UL listing of individual components is not acceptable.

C. Enclosures:

1. NEMA 3R rain-tight aluminum enclosure.
   a. Pad-lockable front door shall include a hinged access plate at the bottom for entry of cables from portable generator or load bank. NEMA 3R integrity shall be maintained with access plate open for cable entry.
   b. Front and side through a front access panel shall be accessible for maintenance.

c. Top, side and bottom through a front access panel shall be accessible for permanent cabling.

D. Phase, Neutral, and Ground Buses:

1. Material: Silver-plated Copper
2. Equipment Ground Bus: bonded to box.
3. Isolated Ground Bus: insulated from box.
4. Ground Bus: 50% of phase size.
5. Neutral Bus: Neutral bus rated 100 percent of phase bus.
6. Round edges on bus.

E. Portable generator connectors shall be Camlok style mounted on gland plate. Camlok to be female Connection and to feed through breaker with Kirk Key interlocked with permanent generator main breaker.

1. Camlok shall be color coded according to system voltage

F. Permanent connections shall be broad range set-screw type, located behind an aluminum barrier.

G. Voltage & Amperage shall be as shown on project one line drawing.

2.8 FINISHES

A. Enclosures: Manufacturer's standard enamel over corrosion-resistant pretreatment and primer.

2.9 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 APPLICATION

A. Four-Pole Switches: Where four-pole switches are indicated, install neutral switching.

3.2 INSTALLATION

A. Floor-Mounted Switch: Level and anchor unit to floor.

B. Floor-Mounting Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 4 inches (100 mm) in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."

C. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

D. Identify components according to Division 26 Section "Identification for Electrical Systems."

E. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.3 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Generator Run Status to Elevator

1. Provide conduit and wire between the transfer switch and each elevator controller.
2. Notify each elevator controller when the building is operating on emergency power

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform tests and inspections and prepare test reports.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

C. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installation, including connections, and to assist in testing.
2. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

6. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

D. Testing Agency's Tests and Inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

E. Coordinate tests with tests of generator and run them concurrently.

F. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

G. Remove and replace malfunctioning units and retest as specified above.

H. Infrared Scanning: After Substantial Completion, but not more than 30 days after Final Acceptance, perform an infrared scan of each switchgear. Remove front and rear panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchgear 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies switchgear checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action. Include scanning results.

3.5 CLEANING

A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean equipment internally, on completion of installation, according to manufacturer's written instructions.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain transfer switches and related equipment as specified below:

1. Coordinate this training with that for generator equipment.
2. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment.
3. Review data in maintenance manuals. Refer to Division 01 Section "Closeout Procedures."

4. Review data in maintenance manuals. Refer to Division 01 Section "Operation and Maintenance Data."
5. Schedule training with Owner, through Architect, with at least seven days' advance notice.
6. Provide a minimum of four hours of instruction.

END OF SECTION 26 3600

PART 1 - PRODUCTS

1.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

1.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

   1. Use flexible or curved forms for curves with a radius 100 feet(30.5 m) or less. All curves to be uniform continuous curves. All circles to have uniform consistent arc with no variations.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1.3 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60(Grade 420); deformed.

D. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60(Grade 420). Cut bars true to length with ends square and free of burrs.

E. Tie Bars: ASTM A 615/A 615M, Grade 60(Grade 420), deformed.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."

1.4 CONCRETE MATERIALS

A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:

   1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
      a. Fly Ash: ASTM C 618, Class C or F.

b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.

C. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.

1. Coarse Aggregate: MDOT 6A or MDOT 6AA.

2. Maximum Coarse-Aggregate Size: 1-1/2 inches(38 mm) nominal.
3. Fine Aggregate: MDOT 2NS.
4. Do not use fine or coarse aggregates containing substances that cause spalling.

D. Water: ASTM C 94/C 94M.

E. Air-Entraining Admixture: ASTM C 260.

F. Chemical Admixtures: ASTM C 494/C 494M, of type suitable for application, certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1.5 FIBER REINFORCEMENT

A. Synthetic Fiber: fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches(13 to 38 mm) long.

1. Products:
   a. Fibrillated Fibers:
      1) Axim Concrete Technologies; Fibrasol F.
      2) FORTA Corporation; Forta.
      3) Euclid Chemical Company (The); Fiberstrand F.
      4) Grace, W. R. & Co.--Conn.; Grace Fibers.
      5) SI Concrete Systems; Fibermesh.

1.6 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

1.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
1. Manufacturers:
   a. Davis Colors.
   b. Scofield, L. M.Company.

2. Color: Color locations as indicated on plans. Color C-1; Charcoal Gray, No. C24 by Scofield. Color C-2; Brownstone, No. 1010 by Scofield. Color C-3, Autumn Beige, No. 0288 by Scofield..

C. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

E. Penetrating Liquid Slab Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products:
   a. Chemisil Plus; ChemMasters.
   b. Day-Chem Sure Hard; Dayton Superior Corporation.
   c. Euco Diamond Hard; Euclid Chemical Co.
   d. Seal Hard; L&M Construction Chemicals, Inc.

1.8 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:

1. Compressive Strength (28 Days): 4000 psi(27.6 MPa).
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 4 inches(100 mm), plus or minus 1 inch(25 mm).
4. Air Content: 5-1/2 percent plus or minus 1.5 percent.

B. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.(0.60 kg/cu. m).

C. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions.

1.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F(30 deg C) and 90 deg F(32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F(32 deg C), reduce mixing and delivery time to 60 minutes.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
   1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph(5 km/h).
   2. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch(13 mm) require correction according to requirements in Division 31 Section "Earth Moving."

2.2 INSTALLATION

2.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Edge Forms and Screed Construction: Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

   1. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

2.4 STEEL REINFORCEMENT

A. Steel Reinforcement: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

   1. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
   2. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

2.5 JOINTS

A. Joints, General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

   1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.

2. Provide tie bars at sides of pavement strips where indicated.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 30 feet), unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch(13 mm) or more than 1 inch(25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness.

1. No Sawed Joints: All scoring to be tooled.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch(6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

2.6 CONCRETE PLACEMENT

A. Concrete Placement: Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

1. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
2. Do not add water to fresh concrete after testing.
3. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
4. Screed pavement surfaces with a straightedge and strike off.
5. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
6. Cold-Weather Placement: Comply with ACI 306.1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
7. Hot-Weather Placement: Comply with ACI 301 when hot-weather conditions exist.

2.7 FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch(1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface according to manufacturer's written instructions.

1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
2. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

D. Penetrating Liquid Slab Treatment: Prepare, apply, and finish penetrating liquid slab treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.

2. Do not apply to concrete that is less than seven days old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

2.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h(1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, or a combination of these methods.

2.9 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch(6 mm).
2. Thickness: Plus 3/8 inch(10 mm), minus 1/4 inch(6 mm).
3. Surface: Gap below 10-foot-(3-m-) long, unleveled straightedge not to exceed 1/4 inch(6 mm).
4. Joint Spacing: 3 inches(75 mm).
5. Contraction Joint Depth: Plus 1/4 inch(6 mm), no minus.
6. Joint Width: Plus 1/8 inch(3 mm), no minus.

2.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd.(76 cu. m) or fraction thereof of each concrete mix placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F(4.4 deg C) and below and when 80 deg F(27 deg C) and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
   a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi(3.4 MPa).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

2.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 1313