



Richard Y. Johnson & Son, Inc.
General Contractors & Construction Managers
Serving Delaware Since 1946
www.ryjson.com

18404 Johnson Rd
PO Box 105
Lincoln, DE 19960
Phone 302-422-3732
Fax 302-422-4696

Sussex Consortium School
Sweet Briar Road Lewes, Delaware 19958
Project No. 200-81485-16006
Bid Pac A – Contracts 1 thru 17
November 17, 2017

Addendum No. 1

Attention all Prospective Bidders:

The following clarifications, changes and /or additions shall by this reference be incorporated into the contract documents as though dully set forth therein.

Addendum No. 1 consists of:

RYJ Written directive (2 pages)
Pre-Bid Meeting Agenda (2 pages)
Pre-Bid Meeting Sign in Sheet (10 pages)
Contractors at Pre-Bid List (6 pages)
Bid Form Sheet 004126-11 (1 page)
Scope Review Meeting Schedule (1 page)
Fearn Clendaniel Written directive (1 page)
Title Sheets Volume 1, 2 & 3 Cover Sheets (3 pages)
Section 000110 Table of Contents (7 pages)
Section 019113 General Commissioning Requirements (10 pages)
Section 019114 Plumbing Commissioning Requirements (10 pages)
Section 019115 HVAC Commissioning Requirements (11 pages)
Section 019116 Electrical Commissioning Requirements (6 pages)

Non – Technical Specifications

NOTE: All Prime Contractors are responsible for bidding from a full set of bidding documents.
This project is a State wage rated project.
No administrative items shall be delivered to the job site.
All correspondence with Architect, Engineer, Owner, Etc. must go through this office.

Application for Payment

All bills are due the 25th of the month. Bills must be on for AIA G702/CMa. Billing will not be processed early, late bills will be rejected.

A total of five copies of each bill and corresponding waiver (one notarized original and 4 copies) are required. Faxed copies will not be accepted.

General Conditions

Please refer to Section 9.3.2; any stored material (including on-site storage) being billed during a pay period must be insured and a certificate of stored material be included with your application for payment. Your payment will not be processed and your bill will be rejected for that period.

Stored materials must stay in the stored materials column, and must be insured, until the material has been incorporated into the building.

Shop Drawings, Product Data and Samples

Submittals are to be submitted via email for review and approval, if certain items are deemed not emailable then ten (10) copies of all submittals are required. Inadequate amounts will be rejected.

Section 004126– Bid Form

REPLACE Bid Form Sheet 004126-11 with attached

- Added “Ceramic Tile” under Contract 11 Floor Covering Work to be a listed sub contractor
**Note: All prime contractors and listed subcontractors are to have a completed Affidavit of Employee Drug Testing Program Form included with their bid.*

Section 011100– Summary of Work

Bid Pac A – Contract 15 Mechanical

Page 011100-34 – **Paragraph A, Add the following:** “238126 – Variable Refrigerant Volume Split Systems with Heat Recovery (Air Cooled Systems).

End of Addendum No. 1



Richard Y. Johnson & Son, Inc.

General Contractors & Construction Managers

Serving Delaware Since 1946

www.ryjson.com

18404 Johnson Rd

PO Box 105

Lincoln, DE 19960

Phone 302-422-3732

Fax 302-422-4696

PRE-BID MEETING

November 15, 2017

3:30 pm

Sussex Consortium School

Bid Pac A

Contracts 1 thru 17

Agenda

1. Introduction of the Owner and the Architect Cape Henlopen School District –
Director of Administrative Services - Mr. Brian Bassett
Architect – Fearn-Clendaniel Architects – Ken Fearn

2. Review projects' description and time frame
- You will be bidding Bid Pac A -

- A-1 Site Work
- A-2 Concrete Work
- A-3 Masonry Work
- A-4 Steel Work
- A-5 Carpentry & General Work
- A-6 Roofing Work
- A-7 Furnish Hollow Metal/Doors/Hardware
- A-8 Aluminum Storefront/Windows/Glass & Glazing
- A-9 Drywall/Metal Stud
- A-10 Acoustical Work
- A-11 Floor Covering Work
- A-12 Caulking/Painting
- A-13 Casework
- A-14 Kitchen Equipment
- A-15 Mechanical
- A-16 Sprinkler System
- A-17 Electrical

- Project involves the construction of an approx. new 66,000 sq.ft. Consortium School with associated site improvements. This is a construction management project.

- Construction starts January 2018. New school has to be finished by June 2019.

Please provide sufficient manpower in your cost to meet the completion date of June 1, 2019.

3. Review Bid date and location
- December 19, 2017 @ 3:30 pm
- Mariner Middle School
16391 Harbeson Road, Milton Delaware 19968
- Mailed bids must be sent to the Cape Henlopen School District Administration Office,
1270 Kings Highway Lewes, Delaware 19958
All **mailed bids** must be received by **12:00 noon** the day of the bid opening, December 19, 2017.
Bidder bears the risk of late delivery.

4. Review the bidding procedures and bonding requirements

- You are bidding a full set of documents.
 - You must use bid form provided in bid documents
 - Review scope of work, section 011100 Summary of Work
 - No exclusions from your scope of work or bid will be rejected!!
 - 10% Bid Bond is required.
 - Public bid opening.
 - This is a mandatory pre-bid meeting.
5. Review the Project
 - Owner to provide building permits, contractor provides all other permits, licenses and inspection fees
 - Architect (Fearn-Clendaniel Architects, Inc.) to summarize.
 - Fifteen (15) Alternates
 - Four (4) Allowances
 - Eight (8) Unit Prices
 6. Receive Bidding questions – R. F. I. to be forwarded to Construction Manager. Email address is jdixon@ryjison.com.
 - RFI's to be in written form only, with plan number or specification number noted with question.
 - No RFI's shall be accepted after 12 noon on Monday, December 11, 2017.
 - All substitutions shall be submitted no later than 12 noon on Monday, December 4, 2017.
 - Addendum notice will be emailed to contractors who have purchased a disk from Richard Y. Johnson & Son, Inc. or purchased plans from Di Carlo Printers or RCI Printing & Graphics. The notice will direct you the Richard Y. Johnson & Son, Inc. website under Plan Room for review of the addendums.
 - State prevailing wage rates apply.
 7. Bidding documents
 - A CD of Contract documents may be obtained at the office of Richard Y. Johnson & Son, Inc., cost of \$20.00 per disk, non-refundable. Checks are to be made payable to “Richard Y. Johnson & Son, Inc.”
 - Additional contract Documents and partial sets can be purchased at DiCarlo Precision Instrument, 2006 Northwood Drive, Salisbury, Maryland, 410-749-0112, or RCI Printing & Graphics, 298 Churchmans Road, New Castle Delaware, (302) 328-5019
 - All Prime Contractors must purchase one disk of the project documents from Richard Y. Johnson & Son, Inc., to ensure receipt of Addenda and other correspondence. If you buy a partial set, you are still responsible for the details on the full set of documents.
 8. Drug testing Requirements
 - All Prime Contractors and listed subcontractors are to include in their bid; signed affidavits that is included in the project documents.
 9. Review Subcontractor List (Current required Subcontractors Listing)
 - Contract A-5 Carpentry & General Works (Elevator)
 - Contract A-15 Mechanical (Controls)
 - Contract A-17 Electrical (Fire Alarm)
 10. Site Visit: TBD if necessary
 11. Receive questions
 12. Summation and Conclusion
 - Please sign in on sheet for pre-bid meeting and list contract number you will be bidding.



Richard Y. Johnson Son, Inc.
 General Contractors Construction Managers
 Serving Delaware Since 1946
www.ryjson.com

18404 Johnson Rd
 PO Box 105
 Lincoln, DE 19960
 Phone 302-422-3732
 Fax 302-422-4696

**Sussex Consortium
 Pre-Bid Contractor List**

Note: Contractors may bid on contracts that they are not listed under. This list is only an assumption of what each contractor is bidding and is written for convenience of reading only.

Contract A-1 Site Work			
Company	Name	Phone Number	Email Address
Corrado Construction	Jerry Denney	302-420-5213	jdenney@corradoconstruction.com
Kent Construction	Kristin Davison	302-653-6469	estimator2@kentconstructionco.com
Gateway Construction	Ray Bruce	302-653-4400	gwc2001@gmail.com
Diamond Materials	Jason Holden	302-658-6524	j.holden@diamondmaterials.com
Thompson & Sons	Timmy Thompson	302-335-3404	thompsonsonsinc@comcast.net
JJID	Ian Regan	302-836-0414	mrouff@jjid.com
Mumford & Miller	Tony Marenco	302-378-7736	tmarenco@mumfordandmiller.com
A-Del Construction	Patrick Kintz	302-354-3720	pkintz@a-del.com; mseitz@a-del.com
Dixie Construction	Keith Jacobi	302-858-5007	keith@dixieconst.com
Utilisite	Bob Murphy	302-945-5022	utilisiteinc@verizon.net
Carrow Construction	Pat McComas	302-322-6442	pat.mccomas@carrowconstruction.com

Contract A-2 Concrete Work			
Company	Name	Phone Number	Email Address
Kent Construction	Kristin Davison	302-653-6469	estimator2@kentconstructionco.com
J. W. Walker	Jeff Walker	302-378-3500	jeff@jwwalker.biz
Mumford and Miller	Tony Marenco	302-378-7736	tmarenco@mumfordandmiller.com
Gullwing Construction	Shaun Baynum	302-632-1512	shaun.gullwing@gmail.com
Carrow Construction	Pat McComas	302-322-6442	pat.mccomas@carrowconstruction.com



Richard Y. Johnson Son, Inc.
General Contractors Construction Managers
Serving Delaware Since 1946
www.ryjson.com

18404 Johnson Rd
PO Box 105
Lincoln, DE 19960
Phone 302-422-3732
Fax 302-422-4696

Contract A-3 Masonry Work

Company	Name	Phone Number	Email Address
L. Wilson Masonry	Nick Humphreys	302-398-8240	nick@wilsonmasonrycompany.com
J. W. Walker	Dave Walker	302-378-3500	dave@jwwalker.biz
D. W. Masonry	Larry Prettyman	302-542-2468	larry@themasonryexperts.com
D. Gingerich	Timmy Halltin	302-382-3640	
Joseph A.Rizzo	Allen Scott	302-519-9646	
Enterprise Masonry	Greg Furtaw	302-764-6858	

Contract A-4 Steel Work

Company	Name	Phone Number	Email Address
Iron Works Inc.	Bob Klerien	302-329-5446	bob@ironworksde.com
RC Fabricators	Billy Sheehan	302-873-8589	bsheehan@rcfabricators.com
Murphy Steel	Matt Baffone	302-366-8676	matt@murphysteel.com
Mid-Atlantic Steel	Allen Rush	302-323-1800	arush@midatlanticsteel.com
Custom Welding	Dan Muffoletto	410-228-4200	dab@custweldfab.com
Summit Steel	Bob Mitchell	302-325-3220	bob@summitsteelde.com

Contract A-5 Carpentry & General Works

Company	Name	Phone Number	Email Address
Kent Construction	Kristin Davison	302-653-6469	estimator2@kentconstructionco.com
North East Constructors	John Vickers	302-218-1168	john.vickers@northeastcontractors.com
ALN	Joe Brorato	302-858-1732	j.brorato@alnconstruction.com
Delaware Elevator	Thomas Palekar	302-462-5192	tpalekar@delawareelevator.com
J & G Group	Robert Simpkins	302-285-3630	keith.hopkins@jgbuildinggroup.com
John L. Briggs Co.	Keith Long	302-856-7033	contact@jlbriggsco.com
BRS Consulting Inc	Robin Schurman	302-786-2326	robin@brsconinc.com
Kencor	Jean Elliott	610-430-2110	jelliott@kencorelevator.com
Conventional Builders	Greg Thompson	302-422-2428	conventionalbuilders@comcast.net
Specialty Finishes	Jim Smykowski	302-283-0397	jsmykowski@specialtyfinishesde.com



Richard Y. Johnson Son, Inc.
General Contractors Construction Managers
Serving Delaware Since 1946
www.ryjson.com

18404 Johnson Rd
PO Box 105
Lincoln, DE 19960
Phone 302-422-3732
Fax 302-422-4696

Contract A-6 Roofing Work

Company	Name	Phone Number	Email Address
Farrell Roofing	Ben Carter	302-378-7660	bcarter@farrellroofinginc.com
CTA Roofing	Mark Cribb	302-454-8551	mark@ctarroofing.com
P & C Roofing	Matt Papa	302-322-6767	matt@pcroofinginc.com
H. K.Griffith Inc.	J. McLaughlin	302-368-4638	john@hkgriffith.com
Quality Exteriors	Jason Stallings	302-398-4283	jason@qualityexteriorsinc.com
D. A. Nolt, Inc.	Matt Ott	856-753-9333	matt@danolt.com

Contract A-7 Furnish Hollow Metal/ Doors/Hardware

Company	Name	Phone Number	Email Address
American Direct	Tom Wilson	302-672-0779	thomasw@americandirectco.com
J & G Group	Robert Simpkins	302-285-3630	keith.hopkins@jgbuildinggroup.com
Salisbury Door & Hardware	Kevin B. Gaylor	410-896-2000	bob@salisburydoor.com

Contract A-8 Aluminum Storefront/ Window/Glass & Glazing

Company	Name	Phone Number	Email Address
Charles Brown Glass	Angel Timmons	410-749-3316	nate@charlesbrownglass.com
Union Wholesale	Gerry Walezburg	302-656-4462	gerryw@uwco.com
Walker Laberge	Robert Rickards	410-749-9400	robertrickards@verizon.net

Contract A-9 Drywall/Metal Stud

Company	Name	Phone Number	Email Address
K. B. Coldiron	Michael White	302-245-8112	mike@kbcoldiron.com
North East Contractors	John Vickers	302-218-1168	john.vickers@northeastcontractors.com
Narissa Building Co	Assiran Dass	302-507-6028	adass@narissabldgco.com
J & G group	Robert Simpkins	302-285-3630	keith.hopkins@jgbuildinggroup.com
J. A. Argetakis	George Grimes	410-633-8016	aargetakis@jaargetakis.com
Peninsula Acoustical	Dan Shaus	302-653-3551	craig.peninsula@gmail.com
Master Interiors	Steven Sanders	302-368-9361	stevens@masterinteriors.com
Narissa Building Co	Goutham Dass	908-619-6137	goutham@narissabldgco.com



Richard Y. Johnson Son, Inc.
General Contractors Construction Managers
Serving Delaware Since 1946
www.ryjson.com

18404 Johnson Rd
PO Box 105
Lincoln, DE 19960
Phone 302-422-3732
Fax 302-422-4696

Contract A-10 Acoustical Work			
Company	Name	Phone Number	Email Address
ALN	Joe Brorato	302-858-1732	j.brorato@alnconstruction.com
North East Contractors	John vickers	302-218-1168	john.vickers@northeastcontractors.com
J & G Group	Robert Simpkins	302-285-3630	keith.hopkins@jgbuildinggroup.com
Union Wholesale	Gerry Walezburg	302-656-4462	Gerry w@uwco.com
J. A. Argetakis	George Grimes	410-633-8016	aargetakis@jaargetakis.com
Peninsula Acoustical	Dan Shaus	302-653-3551	craig.peninsula@gmail.com
Master Interiors	Steven Sanders	302-368-9361	stevens@masterinteriors.com
Erco	Harold Root	302-398-3200	haroldr@ercoonline.com

Contract A-11 Floor Covering			
Company	Name	Phone Number	Email Address
Creative Flooring	Brian Masten	302-757-3885	bmasten-cfc@comcast.net
Old World Tiles	Dan DiFrancesco	302-407-5552	dan@oldworldtileworks.com
Tri-State Carpet	Matt Bucher	302-424-1649	mbucher@trustatecpt.com

Contract A-12 Caulking/Painting			
Company	Name	Phone Number	Email Address
Cassidy Painting	John Metz	302-326-2412	john@cassidypainting.com
Jamestown Painting	Andy Palese	302-322-6767	apalese@jamestownpainting.com
M & S Painting	Chris Mcelroy	302-995-2823	mspainters@aol.com
JA Argetakis	George Grimes	410-633-8016	aargetakis@jaargetakis.com
Coastal Custom painter	Steve Schellinger	302-381-0840	sschell1@msn.com

Contract A-13 Casework			
Company	Name	Phone Number	Email Address
Reed Associates	Michael Weir	484-678-1300	weir@aol.com
Custom Cabinet Shop	Jerry Campbell	302-331-8241	jccs@comcast.net
Modular Concepts	Jeff Foster	410-885-5960	jeff@modconinc.com
3D Fab	Valerie	Watters	greg@3dfab.biz



Richard Y. Johnson Son, Inc.
General Contractors Construction Managers
Serving Delaware Since 1946
www.ryjson.com

18404 Johnson Rd
PO Box 105
Lincoln, DE 19960
Phone 302-422-3732
Fax 302-422-4696

Contract A-14 Kitchen Equipment			
--	--	--	--

Company	Name	Phone Number	Email Address
Paramount Rest.	Rick Gentry	215-913-1252	rgentry@pararest.com
Ashland Equipment Division of Singer	Brandon Bagley	443-943-6056	brandonbjavonebagley@gmail.com
Todd Devin Food Equipment 11400, Inc.	Joe Midash KevinChanko	609-333-8805 717-286-8150	joe.tdfe@gmail.com kchanko@11400inc.com

Contract A-15 Mechanical			
---------------------------------	--	--	--

Company	Name	Phone Number	Email Address
Flo Mechanical	Edward Webb	302-670-0401	elw.1@yahoo.com
Megee Plg & Htg. CO	Larry G. Faist	302-856-6311	lfaist@megeeco.com
John Hiott HVAC	Lisa Hiott	302-697-3050	lisahiott@hiotthvacr.com
Merit Mech	Eddie Apparzelle	302-366-8601	
Albireo Energy	Rick Grimminger	302-218-5944	rgimminger@albieroenergy.com
Cherokee Nation	Carl Rifino	302-480-3557	carl.rifino@cherokee-cnccs.com
Modern Controls	John Anderson	302-325-6800	janderson@moderncontrols.com
Ralph G. Degli Obizzi & Sons	Mark Degli Obizzi	302-652-3593	mark@degli.com
Tri-M Group	David Furio	610-496-5010	dfurio@tri-mgroup.com
Joseph Richardson	Larry Wall	302-398-8101	larry@jtrmech.net
J. F. Sobieski	Brian Bailey	302-743-3235	bbailey@sobieskiinc.com

Contract A-16 Sprinkler System			
---------------------------------------	--	--	--

Company	Name	Phone Number	Email Address
Bear Industries	Ethel Pew	302-368-1311	cjohnston@bearindustries.com
ABJ Sprinkler	Matteo Previtali	609-680-3429	abjoffice@abjsprinkler.com
J. F. Sobieski	Brian Bailey	302-743-3235	bbailey@sobieskiinc.com



Richard Y. Johnson Son, Inc.
General Contractors Construction Managers
Serving Delaware Since 1946
www.ryjson.com

18404 Johnson Rd
PO Box 105
Lincoln, DE 19960
Phone 302-422-3732
Fax 302-422-4696

Contract A-17 Electrical

Company	Name	Phone Number	Email Address
B W Electric	Mike Hines	302-566-6248	mhines.bwelectricinc@gmail.com
Bausum & Duckett Elec	Jacob Foy	443-497-4577	jabobf@bdelec.net
Tudor Electric	Bobby Tudor	302-736-1444	tudorelectricco@comcast.net
Nickle Electrical	Dave Schreffler	302-856-1006	dschreffler@nickle.email
Battaglia Electric	Terri Thomas	302-325-6100	tthomas@battag.com
H & A Electrical	Jeff Adams	302-542-6984	jadams0823@gmail.com
Lywood Electric	Sean Toman	410-299-5953	stoman@lywoodelectic.com
Superior Electric	John McKee	302-658-5949	john@superiorelectric.biz
John Tieder	Wilbur Thomas	443-521-4665	wilbur@tiedercontrols.com
Current Solutions	Gary Wolf	302-736-5210	cursolinc@comcast.net
The Tri-M Group	David Furio	<u>610-496-5010</u>	dfurio@tri-mgroup.com
MSE Electrical	Jim Bailey	<u>302-841-7782</u>	jbailey@midshoreelectrical.com

Miscellaneous Sub Contractors

Company	Name	Phone Number	Email Address
Hillis Carnes Engineers	Dan Herr	443-366-5628	dherr@hcea.com
JCI/Simplex/Tyco	Frank Yoder	443-365-4968	franklin.c.yoder@tider@jci.com
Salisbury Brick	David Hastings	410-430-0561	david@salisburybrick.com

BID FORM

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor **must be listed for each category** where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the *Owner*, it is **required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.**

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>	<u>Subcontractors tax payer ID # or Delaware Business license #</u>
1. Site Work	N/A	N/A	N/A
2. Concrete Work	N/A	N/A	N/A
3. Masonry Work	N/A	N/A	N/A
4. Steel Work	N/A	N/A	N/A
5. Carpentry & General Work - Elevator			
6. Roofing Work	N/A	N/A	N/A
7. Furnish Hollow Metal/ Doors/Hardware	N/A	N/A	N/A
8. Aluminum Storefront/Windows/ Glass & Glazing	N/A	N/A	N/A
9. Drywall/Metal Stud	N/A	N/A	N/A
10. Acoustical Work	N/A	N/A	N/A
11. Floor Covering Work - Ceramic Tile			

Sussex Consortium School Scope Review Meeting Schedule

Location: Richard Y. Johnson & Son's Office; 18404 Johnson Road, Lincoln Delaware 19960

Apparent Low bidders are required to attend

All times are for **Thursday, December 21st 2017**

Contract A-1 Site Work	7:00 am – 7:30 am
Contract A-2 Concrete Work	7:30 am – 8:00 am
Contract A-3 Masonry Work	8:00 am – 8:30 am
Contract A-4 Steel Work	8:30 am – 9:00 am
Contract A-5 Carpentry & General Work	9:00 am - 9:30 am
Contract A-6 Roofing Work	9:30 am – 10:00 am
Contract A-7 Furnish Hollow Metal/Doors/Hardware	10:00 am – 10:30 am
Contract A-8 Aluminum Storefront/Windows/Glass & Glazing	10:30 am – 11:00 am
Contract A-9 Drywall/Metal Stud	11:00 am – 11:30 am
Contract A-10 Acoustical Work	11:30 am – 12:00 pm
Contract A-11 Floor Covering Work	1:00 pm – 1:30 pm
Contract A-12 Caulking/Painting	1:30 pm – 2:00 pm
Contract A-13 Casework	2:00 pm – 2:30 pm
Contract A-14 Kitchen Equipment	2:30 pm – 3:00 pm
Contract A-15 Mechanical	2:30 pm – 3:00 pm
Contract A-16 Sprinkler System	3:00 pm – 3:30 pm
Contract A-17 Electrical	3:30 pm – 4:00 pm

**CAPE HENLOPEN SCHOOL DISTRICT
Sussex Consortium School**

ADDENDUM NO. 1

1.0 NOTICE TO ALL BIDDERS:

- 1.1. Bidders are hereby notified that this Addendum shall be and hereby becomes part of their Contract Documents, and shall be attached to the Project Manual for this project.
- 1.2. The following items are intended to revise and clarify the Contract Documents, and shall be included by the Bidder in their proposal.
- 1.3. Bidders shall verify that their sub-bidders are in full receipt of the information contained herein.

2.0 CLARIFICATIONS:

- 2.1 Drawings and specifications provided on the State website for advertisement purposes should not be used for bidding purposes. Only the drawings purchased at the pre-bid meeting or issued through Richard Y. Johnson & Son office should be used for bidding purposes.

3.0 QUESTIONS: N/A

4.0 CHANGES TO THE DRAWINGS: NA

5.0 CHANGES TO THE SPECIFICATIONS:

- 5.1 Replace cover of specification for volume 1, 2, and 3 with attached indicating "ISSUED FOR BIDDING/CONSTRUCTION" (previous cover indicated "not for Bidding/Construction").
- 5.2 Add attached Commissioning Requirement specification sections 019113, 019114, 09115, 09116. These specifications are indicated in the Table of Contents, but the specifications were not printed/attached.
- 5.3 Table of Contents: move spec section heading '105113 Metal Lockers' to follow section heading '104416 Fire extinguishers'. Revised TOC attached.
- 5.4 Table of Contents: Add missing spec heading '238126 Variable Refrigerant Volume Split Systems with Heat Recovery (Air Cooled Systems)'. Revised TOC attached.
- 5.5 Table of Contents: move spec section heading '283111 Digital, Addressable Fire Alarm System' to follow section heading '280544 Sleeves & Seals for Electronic Safety and Security'. Revised TOC attached.

END OF ADDENDUM NO. 1

SUSSEX CONSORTIUM SCHOOL

**LEWES, DELAWARE
AUGUST 2017**

OWNER

**CAPE HENLOPEN SCHOOL DISTRICT
1270 KINGS HIGHWAY
LEWES, DELAWARE 19958**

ARCHITECT

**FEARN-CLENDANIEL ARCHITECTS
6 LARCH AVENUE, SUITE 398
WILMINGTON, DELAWARE 19804
302-998-7615
PROJECT NO: 16006**

CONSTRUCTION MANAGER

**RICHARD Y. JOHNSON & SON, INC.
18404 JOHNSON ROAD
P.O. BOX 105
LINCOLN, DELAWARE
302-422-3732**

VOLUME I

ISSUED FOR BIDDING / CONSTRUCTION

SUSSEX CONSORTIUM SCHOOL

**LEWES, DELAWARE
AUGUST 2017**

OWNER

**CAPE HENLOPEN SCHOOL DISTRICT
1270 KINGS HIGHWAY
LEWES, DELAWARE 19958**

ARCHITECT

**FEARN-CLENDANIEL ARCHITECTS
6 LARCH AVENUE, SUITE 398
WILMINGTON, DELAWARE 19804
302-998-7615
PROJECT NO: 16006**

CONSTRUCTION MANAGER

**RICHARD Y. JOHNSON & SON, INC.
18404 JOHNSON ROAD
P.O. BOX 105
LINCOLN, DELAWARE
302-422-3732**

VOLUME II

ISSUED FOR BIDDING / CONSTRUCTION

SUSSEX CONSORTIUM SCHOOL

**LEWES, DELAWARE
AUGUST 2017**

OWNER

**CAPE HENLOPEN SCHOOL DISTRICT
1270 KINGS HIGHWAY
LEWES, DELAWARE 19958**

ARCHITECT

**FEARN-CLENDANIEL ARCHITECTS
6 LARCH AVENUE, SUITE 398
WILMINGTON, DELAWARE 19804
302-998-7615
PROJECT NO: 16006**

CONSTRUCTION MANAGER

**RICHARD Y. JOHNSON & SON, INC.
18404 JOHNSON ROAD
P.O. BOX 105
LINCOLN, DELAWARE
302-422-3732**

VOLUME III

ISSUED FOR BIDDING / CONSTRUCTION

SECTION 000110 – TABLE OF CONTENTS

VOLUME I

DIVISION 00 – CONTRACT REQUIREMENTS

Introductory Information

- 000101 Title Page/Consultant Directory
- 000110 Table of Contents
- 000115 List of Drawings
- 001116 Advertisement For Bid

Procurement Information

- 002113 Instructions To Bidders
- 004126 Bid Forms Including:
 - Bid Form
 - Sub Listing
 - Non-Collusion Statement
 - Affidavit Of Employee Drug Testing Program
- 004313 State Of Delaware Bid Bond

Contracting Information

- 005226 Agreement Including Standard Form of Agreement Between Owner And Contractor (AIA A132 – 2009)
- 006113.13 State Of Delaware Performance Bond Form
- 006113.16 State Of Delaware Payment Bond Form
- 006276 Application of Payment (Sample AIA G702 & G703)
- 006276 Monthly Requisition & Continuation Sheet (AIA G732-2009 & G703-1992)
- 006300 Standard Forms Certificates and Modification Forms
- 007226 General Conditions of The Contract For Construction (AIA A232-2009)
- 007300 Supplementary General Conditions A232-2009 Including Attachment “A”
 - Construction Manager General Conditions
- 007346 Delaware Prevailing Wage Rates
- 007316 Insurance Including Sample Certificate of Insurance
- 008000 General Requirements
- 008050 Regulations For Drug Testing On State Of Delaware Public Works Project
- 008114 Drug Testing Forms
- 009300 Reference Materials
 - Geotechnical Report (Boring Logs)
 - Payroll Report Form

DIVISION 01 - GENERAL REQUIREMENTS

- 011100 Summary of Work
- 011200 Multiple Contract Summary
- 011216 Alteration Project Procedures
- 011400 Work Restrictions
- 012000 Price and Payment Procedures
- 012100 Allowances

012200	Unit Prices
012300	Alternates
012500	Substitution Procedures
012501	Substitution Request Sample Form
012600	Contract Modification Procedures
012900	Payment Procedures'
012973	Schedule of Values
013100	Project Management and Coordination
013113	Project Coordination
013216	Construction Schedule
013233	Construction Progress Documentation
013300	Submittal Procedures
013301	CADD Release Form
013319	Field Engineering
013500	Safety
014000	Quality Control
014100	Regulatory Requirements
014200	References
014219	Reference Standards
015000	Temporary Construction Utilities, Facilities & Controls
016000	Materials and Equipment Product Requirements
017000	Contract Closeout
017329	Cutting and Patching
017419	Construction Waste Management
017500	Facility Startup/Commissioning
017700	Closeout Procedures
017836	Warranties
018000	Statement of Special Inspections
019113	General Commissioning Requirements
019114	Plumbing Commissioning Requirements
019115	HVAC Commissioning Requirements
019116	Electrical Systems Commissioning Requirements

VOLUME II

TECHNICAL SPECIFICATIONS

ARCHITECTURAL

033000	Cast-in-Place Concrete
035113	Cementitious Wood Fiber Decks
042000	Unit Masonry
051200	Structural Steel Framing
052100	Steel Joist Framing
053100	Steel Decking
054000	Cold-formed Metal Framing
055000	Metal Fabrications
055113	Metal Pan Stairs
055213	Pipe and Tube Railings

061053	Miscellaneous Rough Carpentry
061600	Sheathing
064023	Interior Architectural Woodwork
064116	Plastic-Laminate-Faced Architectural Cabinets
066400	Plastic Paneling
071113	Bituminous Dampproofing
071353	Elastomeric Sheet Waterproofing (Roof Deck and Paver System)
072100	Thermal Insulation
072119	Foamed-In-Place Insulation
072600	Vapor Retarders
072726	Fluid-Applied Membrane Air Barriers
073113	Asphalt Shingles
074113.16	Standing-Seam Metal Roof Panels
074213.13	Formed Metal Wall Panels
074213.19	Insulated Metal Wall Panels
074293	Soffit Panels
074400.01	Interior Wall Panels
075323	Ethylene-Propylene-Diene-Monomer (EPDM) Roofing
076200	Sheet Metal Flashing and Trim
077100	Roof Specialties
077200	Roof Accessories
077253	Snow Guards
078100	Applied Fireproofing
078123	Intumescent Fireproofing
078413	Fire Protection, HVAC & Plumbing Penetration Firestopping
078443	Joint Firestopping
079200	Joint Sealants
079219	Acoustical Joint Sealants
079500	Expansion Control
081113	Hollow Metal Doors and Frames
081416	Flush Wood Doors
081743	Fiberglass Doors and Frames
083113	Access Doors and Frames
083313	Coiling Counter Doors
083323	Overhead Coiling Doors
084113	Aluminum Framed Entrances and Storefronts
084413	Glazed Aluminum Curtain Walls
085113	Aluminum Windows
087100	Door Hardware
088000	Glazing
089119	Fixed Louvers
092116.23	Gypsum Board Shaft Wall Assemblies
092216	Non-Structural Metal Framing
092900	Gypsum Board
093013	Ceramic Tiling
095113	Acoustical Panel Ceilings
095423	Linear Metal Ceilings
096516.14	Sheet Vinyl Floor Coverings
096519	Resilient Tile Flooring and Accessories
096540	Rubber Flooring

096813	Tile Carpeting
096815	Tile Carpeting (Walk Off Tile)
097723	Fabric Wrapped Panels
099113	Exterior Painting
099123	Interior Painting
101100	Visual Display Units
101400	Interior Signage
101419	Dimensional Letter Signage
101423	Panel Signage
102113.19	Plastic Toilet Compartments
102800	Toilet, Bath, and Laundry Accessories
102239	Folding Panel Partitions
104413	Fire Protection Cabinets
104416	Fire Extinguishers
105113	Metal Lockers
105126	Solid Plastic Lockers
107516	Ground-Set Flagpoles
113100	Residential Appliances
114000	Food Service Equipment
115213	Projection Screens
116623	Gymnasium Equipment
122124	Motorized Roller Shade System
122125	Manual Roller Shades
123216	Manufactured Plastic-Laminate-Faced Casework
123623.13	Plastic-Laminate-Clad Countertops
123661.16	Solid Surfacing Countertops
126100	Fixed Audience Seating
131113	Pool General
142400	Hydraulic Elevators

VOLUME III

TECHNICAL SPECIFICATIONS

DIVISION 21 – FIRE PROTECTION

210500	Common Work Results for Fire Protection
210505	Fire Protection Piping, Fitting and Valves
211000	Water Based Fire Suppression System – Fire Pump

DIVISION 22 – PLUMBING

220500	Common Work Results for Plumbing
220505	Plumbing Piping, Fitting and Valves
220701	Plumbing Insulation
224000	Plumbing Fixtures
224005	Plumbing Equipment

DIVISION 23 - HVAC

230500	Common Work Results for HVAC
230505	HVAC Piping, Fitting and Valves
230548	Vibration Controls for HVAC, Plumbing & Fire Protection Equipment
230593	Testing, Adjusting & Balancing for HVAC and Plumbing
230600	Heating, Ventilating, and Air Conditioning Equipment
230701	HVAC Insulation
230900	Instrumentation and Controls of HVAC & Plumbing Systems
232516	Non Chemical Water Treatment for Evaporative Cooler Recirculating Water
233000	HVAC Air Distribution
233716	Nonmetallic Ductwork
236500	Evaporative Cooler
238125	Variable Refrigerant Volume Split Systems with Heat Recovery (Water Cooled Systems)
238126	Variable Refrigerant Volume Split Systems with Heat Recovery (Air Cooled Systems)
238222	Packaged Kitchen Hood Ventilation Control System
238416	Commercial Swimming Pool Dehumidification Units Pad Mounted with Energy Recovery

DIVISION 26 – ELECTRICAL

260500	Common Work Results for Electrical
260510	Elevator Equipment Wiring & Provisions
260511	Cooler and Freezer Wiring
260512	Kitchen Equipment Wiring
260519	Conductors and Cables
260520	Electrical Heating Cables
260526	Grounding and Bonding
260528	Electrical Firestopping
260529	Hangers and Supports
260533	Raceway and Boxes
260535	Miscellaneous Raceway System
260543	Underground Ductbanks
260545	Utility Holes
260547	Textile Innerduct
260553	Electrical Identification
260573	Electrical Systems Analysis
260924	Lighting Control System
260926	Occupancy Sensors
260943	Network Lighting Controls
261120	Utility Incoming Service Provisions
262200	Transformers
262413	Switchboards
262416	Panelboards
262726	Wiring Devices
262813	Fuses
262816	Disconnect Switches and Enclosed Circuit Breakers
262913	Motor Controllers

263323	Central Battery Emergency Lighting System
264113	Lightning Protection
265100	Interior Lighting
265600	Exterior Lighting

DIVISION 27 – COMMUNICATIONS

270000	General Communications Provisions
270500	Common Work Results for Communications
270528	Conduit & Backboxes for Communications Systems
270529	Hangers and Supports for Communications
270530	Cable Trays for Communications
270544	Sleeves & Seals for Communications Pathways
271000	Telecommunication Cabling
271100	Communications Equipment Room Fittings
275200	Grounding & Bonding for Communications

DIVISION 28 – ELECTRONIC SAFETY & SECURITY

280500	Common Work Results for Electronic Safety and Security
280544	Sleeves & Seals for Electronic Safety and Security
283111	Digital, Addressable Fire Alarm System
285200	Grounding & Bonding for Electronic Safety and Security
285800	Conduit & Backboxes for Electronic Safety and Security

DIVISION 31 – EARTHWORK

310000	Earthwork
311000	Site Clearing
311100	Clearing and Grubbing
312300	Excavation and Backfill for Pipelines and Structures
312500	Erosion & Sediment Control
313116	Termite Control
313200	Soil Stabilization
315000	Excavation Support and Protection

DIVISION 32 – EXTERIOR IMPROVEMENTS

321126	Bituminous Stabilized Base Courses
321136	Concrete Base Courses
321216	Asphalt Paving
321313	Concrete Paving (Sidewalks)
321600	Curbs and Gutters
323000	Site Improvements and Amenities
323100	Fences and Gates
323119	Decorative Metal Fences and Gates
329000	Planting
329200	Turf and Grasses

DIVISION 33 – UTILITIES

Cape Henlopen School District
Sussex Consortium School
Lewes, Delaware

August 2017
Fearn-Clendaniel Architects, Inc.

331000 Water Utilities
333000 Sanitary Sewerage System
334000 Storm Drainage Utilities
334700 Pond and Reservoir Liners

END OF TABLE OF CONTENTS

DIVISION 01
SECTION 019113
GENERAL COMMISSIONING REQUIREMENTS
TABLE OF CONTENTS

PART 1. GENERAL

- 1.1. RELATED DOCUMENTS
- 1.2. SUMMARY
- 1.3. DEFINITIONS
- 1.4. COMMISSIONING TEAM
- 1.5. OWNER'S RESPONSIBILITIES
- 1.6. CONTRACTOR'S RESPONSIBILITIES
- 1.7. CxA'S RESPONSIBILITIES
- 1.8. COMMISSIONING DOCUMENTATION
- 1.9. SUBMITTALS
- 1.10. QUALITY ASSURANCE
- 1.11. COORDINATION
- 1.12. ALTERNATES

PART 2. PRODUCTS – NOT USED

PART 3. EXECUTION

- 3.1. OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.
- B. Related Sections include the following:
 - 1. Division 01 Section "*HVAC Commissioning Requirements*" for specific requirements for commissioning HVAC systems.
 - 2. Division 01 Section "*Electrical Commissioning Requirements*" for specific requirements for commissioning electrical systems.
 - 3. Division 01 Section "*Plumbing System Commissioning Requirements*" for specific requirements for commissioning Plumbing systems.
 - 4. Division 01 Section "*Contract Closeout*" for specific requirements for closeout at substantial and final completion.
 - 5. Division 01 Section "*Contract Closeout*" for Specific Requirements for training and demonstration of systems to Owner.
 - 6. Division 01 Section "*Contract Closeout*" for Specific Requirements related to the Preparation of systems operation and maintenance manuals.

1.3 DEFINITIONS

- A. CxA: Commissioning Authority.
- B. OPR: Owner's Project Requirements.
- C. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.
- D. TAB: Testing, Adjusting, and Balancing.

1.4 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Owner:
 - 1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract. The CxA for this project shall be performed by Gipe Associates, Inc., 8719 Brooks Drive, Easton, Maryland 21601, (410) 822-8688 - telephone, (410) 822-6306 – fax.
 - 2. All contractor commissioning requirements and costs associated with commissioning the project shall be included in the base bid.
 - 3. Representatives of the facility user and operation and maintenance personnel.
 - 4. Architect and Engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

- A. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
 - 1. Coordination meetings.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Testing meetings.
 - 4. Demonstration of operation of systems, subsystems, and equipment.

1.6 CONTRACTOR'S RESPONSIBILITIES

- A. Provide utility services required for the commissioning process.
- B. Contractor shall assign representatives with expertise and authority to act on behalf of the Contractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
 - 1. Participate in commissioning and construction-phase coordination meetings.
 - 2. Participate in maintenance orientation and inspection.
 - 3. Participate in operation and maintenance training sessions.
 - 4. Participate in final review at acceptance meeting.
 - 5. Certify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
 - 6. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - 7. Review and approve final commissioning documentation.

8. Certify that all pre-test work is complete and operational prior to scheduling performed testing by CxA.
 9. During functional performance testing, a representative from the mechanical contractor, controls contractor, and test/balance engineer must be present and participate in testing.
- C. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
1. Pre-test all systems/equipment prior to engaging CxA for Functional Performance Testing.
 2. Participate in commissioning and construction-phase coordination meetings.
 3. Participate in maintenance orientation and inspection.
 4. Participate in procedures meeting for testing.
 5. Participate in final review at acceptance meeting.
 6. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to CxA for incorporation into the commissioning plan. Update schedule on a weekly basis throughout the construction period.
 7. Provide information to the CxA for developing construction-phase commissioning plan.
 8. Participate in training sessions for Owner's operation and maintenance personnel.
 9. Provide updated Project Record Documents to the CxA on a daily basis.
 10. Gather and submit operation and maintenance data for systems, subsystems, and equipment to the CxA, as specified in Division 01 Section "Operation and Maintenance Data."
 11. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures and participate in testing of installed systems, subsystems, and equipment.
 12. The test/balance subcontractor, mechanical contractor, and automatic temperature controls subcontractor must be on-site and provide assistance during all functional performance testing.

1.7 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Prepare a construction-phase commissioning plan. Collaborate with Contractor and with subcontractors to develop test and inspection procedures. Include design changes and scheduled commissioning activities coordinated with overall Project schedule. Identify commissioning team member responsibilities, by name, firm, and trade specialty, for performance of each commissioning task.
- C. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss progress of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The CxA shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.
- D. At a mutually agreed upon time, conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for

operation and maintenance submittals; operation and maintenance training sessions; TAB Work; and Project completion.

- E. Observe and inspect construction and report progress and deficiencies. In addition to compliance with the Contract Documents, inspect systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.
- F. Prepare Project-specific test and inspection procedures and checklists.
- G. Schedule, direct, witness, and document tests, inspections, and systems startup.
- H. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.
- I. Certify date of acceptance and startup for each item of equipment for start of warranty periods.
- J. Review Project Record Documents for accuracy. Request revisions from Contractor to achieve accuracy. Project Record Documents requirements are specified in Division 01 Section "Project Record Documents."
- K. Review and comment on operation and maintenance documentation and systems manual outline for compliance with the Contract Documents. Operation and maintenance documentation requirements are specified in Division 01 Section "Operation and Maintenance Data."
- L. Assemble the final commissioning documentation, including the commissioning report and Project Record Documents.

1.8 COMMISSIONING DOCUMENTATION

- A. Commissioning Plan: A document, prepared by CxA, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited to the following:
 - 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
 - 2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
 - 3. Identification of systems and equipment to be commissioned.
 - 4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
 - 5. Identification of items that must be completed before the next operation can proceed.
 - 6. Description of responsibilities of commissioning team members.
 - 7. Description of observations to be made.
 - 8. Description of requirements for operation and maintenance training, including required training materials.

9. Description of expected performance for systems, subsystems, equipment, and controls.
 10. Schedule for commissioning activities with specific dates coordinated with overall construction schedule.
 11. Identification of installed systems, subsystems, and equipment, including design changes that occurred during the construction phase.
 12. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
 13. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
 14. Step-by-step procedures for testing systems, subsystems, and equipment with descriptions for methods of verifying relevant data, recording the results obtained, and listing parties involved in performing and verifying tests.
- B. Test Checklists: CxA, with assistance of Contractor and Subcontractors, shall develop test checklists for each system, subsystem, or equipment including interfaces and interlocks, and include a separate entry, with space for comments, for each item to be tested. Prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. Provide space for testing personnel to sign off on each checklist. Specific checklist content requirements are specified in Division 01 Section *"HVAC Commissioning Requirements"*, *"Electrical Commissioning Requirements"* and *"Plumbing System Commissioning Requirements"*. Test checklists will be jointly developed as the project progresses. Each checklist, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:
1. Name and identification code of tested item.
 2. Test number.
 3. Time and date of test.
 4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
 5. Dated signatures of the person performing test and of the witness, if applicable.
 6. Individuals present for test.
 7. Deficiencies.
 8. Issue number, if any, generated as the result of test.
- C. Certificate of Readiness: Certificate of Readiness shall be signed by Contractor, Subcontractor(s), Installer(s), and CxA certifying that systems, subsystems, equipment, and associated controls are ready for testing. Completed test checklists signed by the responsible parties shall accompany this certificate.
- D. Test and Inspection Reports: CxA shall record test data, observations, and measurements on test checklists. Photographs, forms, and other means appropriate for the application shall be included with data. CxA shall compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.
- E. Corrective Action Documents: CxA shall document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.

- F. Issues Log: CxA shall prepare and maintain an issues log that describes design, installation, and performance issues that are at variance with the Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.
1. Creating an Issues Log Entry:
 - a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
 - b. Assign a descriptive title of the issue.
 - c. Identify date and time of the issue.
 - d. Identify test number of test being performed at the time of the observation, if applicable, for cross-reference.
 - e. Identify system, subsystem, and equipment to which the issue applies.
 - f. Identify location of system, subsystem, and equipment.
 - g. Include information that may be helpful in diagnosing or evaluating the issue.
 - h. Note recommended corrective action.
 - i. Identify commissioning team member responsible for corrective action.
 - j. Identify expected date of correction.
 - k. Identify person documenting the issue.
 2. Documenting Issue Resolution:
 - a. Log date correction is completed or the issue is resolved.
 - b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
 - c. Identify changes to the Contract Documents that may require action.
 - d. State that correction was completed and system, subsystem, and equipment is ready for retest, if applicable.
 - e. Identify person(s) who corrected or resolved the issue.
 - f. Identify person(s) documenting the issue resolution.
 3. Issues Log Report: On a periodic basis, but not less than for each commissioning team meeting, CxA shall prepare a written narrative for review of outstanding issues and a status update of the issues log. As a minimum, CxA shall include the following information in the issues log and expand it in the narrative:
 - a. Issue number and title.
 - b. Date of the identification of the issue.
 - c. Name of the commissioning team member assigned responsibility for resolution.
 - d. Expected date of correction.
- G. Commissioning Report: CxA shall document results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The commissioning report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the Contract Documents. The commissioning report shall include, but is not limited to, the following:
1. Lists and explanations of substitutions; compromises; variances in the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve

as a future reference document during Owner occupancy and operation. It shall describe components and performance that exceed requirements of the Contract Documents and those that do not meet requirements of the Contract Documents. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.

2. Commissioning plan.
3. Testing plans and reports.
4. Corrective modification documentation.
5. Issues log.
6. Completed test checklists.
7. Listing of off-season test(s) not performed and a schedule for their completion.
8. All commissioning documents must be submitted to the building Owner within 90 days of the date of receipt of the Certificate of Occupancy.

- H. Systems Manual: CxA shall gather required information and compile systems manual. Systems manual shall include, but is not limited to, the following:
1. Project Record Documents as specified in Division 01 Section "Project Record Documents."
 2. Final commissioning plan.
 3. Commissioning report.
 4. Operation and maintenance data as specified in Division 01 Section "Operation and Maintenance Data."

1.9 SUBMITTALS

- A. Test Checklists and Report Forms: CxA shall submit sample checklists and forms to Contractor quality-control manager and subcontractors for review and comment. Submit two copies of each checklist and report form.
- B. Test and Inspection Reports: CxA shall submit test and inspection reports.
- C. Corrective Action Documents: CxA shall submit corrective action documents.

1.10 QUALITY ASSURANCE

- A. Instructor Qualifications: Factory-authorized service representatives, experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.
- B. Test Equipment Calibration: Comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.11 COORDINATION

- A. Coordinating Meetings: CxA shall conduct coordination meetings of the commissioning team to review progress on the commissioning plan, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.

- B. Pretesting Meetings: CxA shall conduct pretest meetings of the commissioning team to review startup reports, pretest inspection results, testing procedures, testing personnel and instrumentation requirements, and manufacturers' authorized service representative services for each system, subsystem, equipment, and component to be tested.
- C. Testing Coordination: CxA shall coordinate sequence of testing activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- D. Manufacturers' Field Services: CxA and Contractor shall coordinate services of manufacturers' field services.

1.12 ALTERNATES

- A. Refer to Division 01 Section, "Alternates" for description of work under this section affected by alternates.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

- A. Training Preparation Conference: Before operation and maintenance training, CxA shall convene a training preparation conference to include Owner's operation and maintenance personnel, Contractor, and subcontractors. In addition to requirements specified in Division 01 Section "Demonstration and Training," perform the following:
 - 1. Review installed systems, subsystems, and equipment.
 - 2. Review instructor qualifications.
 - 3. Review instructional methods and procedures.
 - 4. Review training module outlines and contents.
 - 5. Review course materials (including operation and maintenance manuals).
 - 6. Inspect and discuss locations and other facilities required for instruction.
 - 7. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
 - 8. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.
- B. Training Modules: Develop an instruction program that includes individual training modules for each system, subsystem, and equipment as specified in Division 01 Section "Demonstration and Training."

Cape Henlopen School District
Sussex Consortium School
Lewes, Delaware

August 2017
Fearn-Clendaniel Architects, Inc.

END OF SECTION

DIVISION 01
SECTION 019114
PLUMBING COMMISSIONING REQUIREMENTS
TABLE OF CONTENTS

PART 1 GENERAL

- 1.1 RELATED DOCUMENTS
- 1.2 SUMMARY
- 1.3 DEFINITIONS
- 1.4 CONTRACTOR'S RESPONSIBILITIES
- 1.5 COMMISSIONING DOCUMENTATION
- 1.6 SUBMITTALS
- 1.7 ALTERNATES

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

- 3.1 TESTING PREPARATION
- 3.2 TAB VERIFICATION
- 3.3 TESTING

SECTION 019114- PLUMBING COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for commissioning the plumbing system and its subsystems and equipment. This Section supplements the general requirements specified in Division 01 Section "General Commissioning Requirements."
- B. Related Sections include the following:
 - 1. Division 01 Section "General Commissioning Requirements" for general requirements for commissioning processes that apply to this Section.
- C. The following systems and/or equipment shall be commissioned:
 - 1. Domestic hot water re-circulating system.
 - 2. Emergency eyewash/shower systems, mixing valves, and equipment.
 - 3. Domestic hot water heaters.
 - 4. Backflow preventers.
 - 5. High/Low mixing valves.
 - 6. Plumbing Fixtures.
 - 7. Elevator sump pump and controls.
 - 8. Domestic water meter (including interlock to ATC system).
 - 9. Thermostatic mixing valves below hand sinks/lavs.
 - 10. Trap priming stations.
 - 11. Domestic booster pump system.
 - 12. Duplex sump pumps and controls.
 - 13. Shower head flow rates.
 - 14. Domestic water pumps.
 - 15. Plumbing Pumps.

1.3 DEFINITIONS

- A. Architect: Includes Architect identified in the Contract for Construction between Owner and Contractor, plus consultant/design professionals responsible for design of plumbing systems, electrical, communications, controls for plumbing systems, and other related systems.
- B. CxA: Commissioning Authority.

- C. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.
- D. TAB: Testing, Adjusting, and Balancing.

1.4 CONTRACTOR'S RESPONSIBILITIES

- A. The following responsibilities are in addition to those specified in Division 01 Section "General Commissioning Requirements."
- B. Contractor:
 - 1. Attend procedures meeting for TAB Work.
 - 2. Certify that TAB Work is complete.
 - 3. Assist performing functional performance tests.
- C. Mechanical Contractor:
 - 1. Attend TAB verification testing.
 - 2. Provide measuring instruments and logging devices to record test data, and data acquisition equipment to record data for the complete range of testing for the required test period.
 - 3. Assist performing functional performance tests.
- D. HVAC Instrumentation and Control Contractor: With the CxA, review control designs for compliance with the Contract Documents, controllability with respect to actual equipment to be installed, and recommend adjustments to control designs and sequence of operation descriptions.
- E. TAB Subcontractor:
 - 1. Contract Documents Review: With the CxA, review the Contract Documents before developing TAB procedures.
 - a. Verify the following:
 - 1) Accessibility of equipment and components required for TAB Work.
 - 2) Adequate number and placement of duct balancing dampers to allow proper balancing while minimizing sound levels in occupied spaces.
 - 3) Adequate number and placement of balancing valves to allow proper balancing and recording of water flow.
 - 4) Adequate number and placement of test ports and test instrumentation to allow reading and compilation of system and equipment performance data needed to conduct both TAB and commissioning testing.
 - 5) Air and water flow rates have been specified and compared to central equipment output capacities.
 - b. Identify discontinuities and omissions in the Contract Documents.

- c. This review of the Contract Documents by the TAB Subcontractor satisfies requirements for a design review report as specified in Division 23 Section "Testing Adjusting & Balancing for HVAC & Plumbing."
 - d. Assist performing functional performance tests.
2. Additional Responsibilities: Participate in tests specified in Division 23 Sections "Instrumentation & Controls of HVAC & Plumbing Systems."
- F. Electrical Contractor:
1. With the Mechanical Contractor, coordinate installations and connections between and among electrical and plumbing systems, subsystems, and equipment.
 2. Attend TAB verification testing.

1.5 COMMISSIONING DOCUMENTATION

- A. The following are in addition to documentation specified in Division 01 Section "General Commissioning Requirements."
- B. Test Checklists: CxA with assistance of Contractor shall develop test checklists for plumbing systems, subsystems, and equipment, including interfaces and interlocks with other systems. CxA shall prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. In addition to the requirements specified in Division 01 Section "General Commissioning Requirements," checklists shall include, but not be limited to, the following:
 1. Calibration of sensors and sensor function.
 2. Testing conditions under which test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of test.
 3. Control sequences for plumbing systems.
 4. Strength of control signal for each set point at specified conditions.
 5. Responses to control signals at specified conditions.
 6. Sequence of response(s) to control signals at specified conditions.
 7. Electrical demand or power input at specified conditions.
 8. Power quality and related measurements.
 9. Expected performance of systems, subsystems, and equipment at each step of test.
 10. Narrative description of observed performance of systems, subsystems, and equipment. Notation to indicate whether the observed performance at each step meets the expected results.
 11. Interaction of auxiliary equipment.
 12. Issues log.

1.6 SUBMITTALS

- A. The following submittals are in addition to those specified in Division 01 Section "General Commissioning Requirements."

- B. Testing Procedures: CxA shall submit detailed testing plan, procedures, and checklists for each series of tests. Submittals shall include samples of data reporting sheets that will be part of the reports.
- C. Certificate of Readiness: CxA shall compile certificates of readiness from Contractor certifying that systems, subsystems, equipment, and associated controls are ready for testing.
- D. Certificate of Completion of Installation, Prestart, and Startup: CxA shall certify that installation, prestart, and startup activities have been completed. Certification shall include completed checklists provided by TAB Subcontractor as specified in Division 23 Section "Testing Adjusting & Balancing for HVAC & Plumbing."
- E. Certified Pipe Cleaning and Flushing Report: CxA shall certify that pipe cleaning, flushing, hydrostatic testing, and chemical treating have been completed.
- F. Test and Inspection Reports: CxA shall compile and submit test and inspection reports and certificates, and shall include them in systems manual and commissioning report.
- G. Corrective Action Documents: CxA shall submit corrective action documents.
- H. Certified TAB Reports: CxA shall submit verified, certified TAB reports.

1.7 ALTERNATES

- A. Refer to Division 01 Section, "Alternates" for description of work under this section affected by alternates.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

- A. Prerequisites for Testing:
 - 1. Certify that plumbing systems, subsystems, and equipment have been completed, calibrated, and started; are operating according to the Contract Documents; and that Certificates of Readiness are signed and submitted.
 - 2. Certify that plumbing instrumentation and control systems have been completed and calibrated; are operating according to the Contract Documents; and that pretest set points have been recorded.
 - 3. Certify that plumbing procedures have been completed, and that TAB reports have been submitted, discrepancies corrected, and corrective work approved.
 - 4. Test systems and intersystem performance after approval of test checklists for systems, subsystems, and equipment.

5. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
6. Verify each operating cycle after it has been running for a specified period and is operating in a steady-state condition.
7. Inspect and verify the position of each device and interlock identified on checklists. Sign off each item as acceptable, or failed. Repeat this test for each operating cycle that applies to system being tested.
8. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
9. Annotate checklist or data sheet when a deficiency is observed.
10. Verify equipment interface with monitoring and control system and TAB criteria; include the following:
 - a. Flow rates for domestic re-circulating systems.
 - b. Temperature for emergency eyewash/shower systems.
 - c. Discharge temperatures of water heaters.
 - d. Re-circ. pump pressures and flow rates.
 - e. High/low mixing valve temperatures and water flow rates.
 - f. Elevator sump pump control and alarms.
 - g. Domestic water meter total volume in gallons.
 - h. Flow rates in gallons per minute for showerheads.
 - i. Trap priming station water discharge.
 - j. Discharge and return temperatures at solar thermal system.
 - k. Duplex sump pump, controls, and alarms.
 - l. Water heater temperatures and set points.
11. Verify proper responses of monitoring and control system controllers and sensors to include the following:
 - a. For each controller or sensor, record the indicated monitoring and control system reading and the test instrument reading. If initial test indicates that the test reading is outside of the control range of the installed device, check calibration of the installed device and adjust as required. Retest malfunctioning devices and record results on checklist or data sheet.
 - b. Report deficiencies and prepare an issues log entry.

12. Verify that plumbing equipment field quality-control testing has been completed and approved. CxA shall direct, witness, and document field quality-control tests, inspections, and startup specified in individual Division 22 Sections.
 13. Verify flow rates of all aerators.
 14. Verify the operation of all plumbing fixtures.
- B. Testing Instrumentation: Install measuring instruments and logging devices to record test data for the required test period. Instrumentation shall monitor and record full range of operating conditions and shall allow for calculation of total capacity of system for each mode of operation. Operational modes include the following:
1. Occupied and unoccupied.
 2. Emergency power supply.
 3. Life-safety and safety systems.
 4. Temporary upset of system operation.
 5. Partial occupancy conditions.
 6. Special cycles.
 7. Alarm conditions.
 8. Lead/lag operation where redundant equipment is indicated.
 9. All alarms.

3.2 TAB VERIFICATION

- A. TAB Subcontractor shall coordinate with CxA for work required in Division 23 Section "Testing Adjusting & Balancing for HVAC & Plumbing." TAB Subcontractor shall copy CxA with required reports, sample forms, checklists, and certificates.
- B. Contractor, Plumbing Contractor, and CxA shall witness TAB Work.
- C. TAB Preparation:
1. TAB Subcontractor shall provide CxA with data required for "Pre-Field TAB Engineering Reports" specified in Division 23 Section "Testing Adjusting & Balancing for HVAC & Plumbing."
 - a. CxA shall use this data to certify that prestart and startup activities have been completed for systems, subsystems, and equipment installation.
- D. Verification of Final TAB Report:
1. CxA shall select, at random, 10 percent of report for field verification.
 2. CxA shall notify TAB Subcontractor 10 days in advance of the date of field verification; however, notice shall not include data points to be verified. The TAB Subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
 3. Failure of an item is defined as follows:

- a. A deviation of more than 10 percent.
4. Failure of more than 10 percent of selected items shall result in rejection of final TAB report.
- E. If deficiencies are identified during verification testing, CxA shall notify the HVAC Contractor and Architect, and shall take action to remedy the deficiency. Architect shall review final tabulated checklists and data sheets to determine if verification is complete and that system is operating according to the Contract Documents.
- F. CxA shall certify that TAB Work has been successfully completed.

3.3 TESTING

- A. Test systems and intersystem performance after test checklists for systems, subsystems, and equipment have been approved.
- B. Perform tests using design conditions whenever possible.
 1. Simulate conditions by imposing an artificial load when it is not practical to test under design conditions and when written approval for simulated conditions is received from CxA. Before simulating conditions, calibrate testing instruments. Set and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
 2. Alter set points when simulating conditions is not practical and when written approval is received from CxA.
 3. Alter sensor values with a signal generator when design or simulating conditions and altering set points are not practical. Do not use sensor to act as signal generator to simulate conditions or override values.
- C. Scope of Plumbing Contractor Testing:
 1. Testing scope shall include entire plumbing installation, from central hot water heating equipment for heat generation through distribution systems to each fixture. It shall include measuring capacities and effectiveness of operational and control functions.
 2. Test all operating modes, interlocks, control responses, responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
 3. Test all plumbing fixtures.
 4. Test time to reach temperature and temperature of hot water at all fixtures with thermostatic mixing valves.
 5. Test discharge of water at all trap priming stations.
 6. Verify that all backflow preventers have been tested. Document in writing.
 7. Test operation and interlock of all sump pumps including elevator sump pumps.
 8. Test operation of all water meters.
 9. Test domestic water heaters.
 10. Test water meters and interlock with ATC system.
 11. Test operation, set points, and safeties of water heaters.
 12. Test flow rate, pressures, set points, and safeties of domestic booster pump.

13. Verify that backflow preventers have been tested.
 14. Test discharge of water at all trap priming stations.
 15. Test the operation of all domestic water solenoid valves, including interlocks to switches.
- D. Detailed Testing Procedures: CxA, with Plumbing Contractor, TAB Subcontractor, and Plumbing Instrumentation and Control Contractor, shall prepare detailed testing plans, procedures, and checklists for plumbing systems, subsystems, and equipment.
- E. HVAC Instrumentation and Control System Testing:
1. Field testing plans and testing requirements are specified in Division 23 Section "Instrumentation & Controls of HVAC & Plumbing Systems." The CxA, Plumbing Contractor, and the HVAC Instrumentation and Control Contractor shall collaborate to prepare testing plans.
 2. CxA shall convene a meeting of appropriate entities to review test report of HVAC instrumentation and control systems.
- F. Plumbing System Testing: Plumbing Contractor shall prepare a testing plan to verify performance of water heaters, emergency eyewash/shower systems, domestic re-circulating systems, backflow preventers, plumbing fixtures, trap priming stations, high/low mixing valves, domestic pumps, elevator sump pumps and auxiliary equipment, domestic water meters, thermostatic mixing valves, and duplex sump pumps. Plan shall include the following:
1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
 2. Tracking checklist for managing and ensuring that all pipe sections have been tested.
 3. Design and actual measurements for all equipment.
- G. Deferred Testing:
1. If tests cannot be completed because of a deficiency outside the scope of the plumbing system, the deficiency shall be documented and reported to Owner. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.
 2. If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed and documented and additional tests scheduled.
- H. Testing Reports:
1. Reports shall include measured data, data sheets, and a comprehensive summary describing the operation of systems at the time of testing.
 2. Include data sheets for each controller to verify proper operation of the control system, the system it serves, the service it provides, and its location. For each controller, provide space for recording its readout, the reading at the controller's sensor(s), plus comments. Provide space for testing personnel to sign off on each data sheet.
 3. Prepare a preliminary test report. Deficiencies will be evaluated by Architect to determine corrective action. Deficiencies shall be corrected and test repeated.

Cape Henlopen School District
Sussex Consortium School
Lewes, Delaware

August 2017
Fearn-Clendaniel Architects, Inc.

END OF SECTION

DIVISION 01
SECTION 019115
HVAC COMMISSIONING REQUIREMENTS
TABLE OF CONTENTS

PART 1. GENERAL

- 1.1. RELATED DOCUMENTS
- 1.2. SUMMARY
- 1.3. DEFINITIONS
- 1.4. CONTRACTOR'S RESPONSIBILITIES
- 1.5. COMMISSIONING DOCUMENTATION
- 1.6. SUBMITTALS
- 1.7. ALTERNATES

PART 2. PRODUCTS – NOT USED

PART 3. EXECUTION

- 3.1. TESTING PREPARATION
- 3.2. TAB VERIFICATION
- 3.3. TESTING

SECTION 019115 - HVAC COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for commissioning the HVAC system and its subsystems and equipment. This Section supplements the general requirements specified in Division 01 Section "General Commissioning Requirements."
- B. Related Sections include the following:
 - 1. Division 01 Section "General Commissioning Requirements" for general requirements for commissioning processes that apply to this Section.
- C. The following systems and/or equipment shall be commissioned:
 - 1. Air Flow Monitoring Stations.
 - 2. Automatic Temperature Control System.
 - 3. Boilers and burners.
 - 4. Condensate overflow alarms.
 - 5. Condensate pumps.
 - 6. Carbon Monoxide Systems.
 - 7. Closed Circuit Evaporative Cooler.
 - 8. Demand Meter/ATC Interface.
 - 9. Differential Pressure by-pass valves.
 - 10. Differential Static Pressure Controllers.
 - 11. Dryer Duct Booster System.
 - 12. Dual temperature system.
 - 13. Duct detectors.
 - 14. Ductless air conditioning units.
 - 15. Electric Heaters/Radiant Heat Panels.
 - 16. Energy recovery ventilators (Including variable frequency drives).
 - 17. Energy Recovery Modules.
 - 18. Exhaust Fans and ventilation fans.
 - 19. Flow measuring stations.
 - 20. Flow Switches.
 - 21. Freeze protection pumps.
 - 22. Heat Exchanger.
 - 23. High temperature alarms.
 - 24. Hot water systems.
 - 25. HVAC controls and sequences of operation.

26. Kitchen ventilation system.
27. Pumps.
28. Supply air systems.
29. Unit Heaters.
30. Variable frequency drives.
31. Variable refrigerant volume systems (indoor, water cooled, and air cooled units).
32. Variable refrigerant volume system ATC interface and systems integration.
33. Ventilation fans.
34. Water meter/ATC interface.
35. Water to air heat pumps.
36. Water to water heat pumps.

1.3 DEFINITIONS

- A. Architect: Includes Architect identified in the Contract for Construction between Owner and Contractor, plus consultant/design professionals responsible for design of HVAC, electrical, communications, controls for HVAC systems, and other related systems.
- B. CxA: Commissioning Authority.
- C. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.
- D. TAB: Testing, Adjusting, and Balancing.

1.4 CONTRACTOR'S RESPONSIBILITIES

- A. The following responsibilities are in addition to those specified in Division 01 Section "General Commissioning Requirements."
- B. Contractor:
 1. Attend procedures meeting for TAB Work.
 2. Certify that TAB Work is complete.
 3. Assist performing functional performance tests.
- C. Mechanical Contractor:
 1. Attend TAB verification testing.
 2. Provide measuring instruments and logging devices to record test data, and data acquisition equipment to record data for the complete range of testing for the required test period.
 3. Assist performing functional performance tests.
- D. HVAC Instrumentation and Control Contractor: With the CxA, review control designs for compliance with the Contract Documents, controllability with respect to actual equipment to be installed, and recommend adjustments to control designs and sequence of operation descriptions.

E. TAB Subcontractor:

1. Contract Documents Review: With the CxA, review the Contract Documents before developing TAB procedures.
 - a. Verify the following:
 - 1) Accessibility of equipment and components required for TAB Work.
 - 2) Adequate number and placement of duct balancing dampers to allow proper balancing while minimizing sound levels in occupied spaces.
 - 3) Adequate number and placement of balancing valves to allow proper balancing and recording of water flow.
 - 4) Adequate number and placement of test ports and test instrumentation to allow reading and compilation of system and equipment performance data needed to conduct both TAB and commissioning testing.
 - 5) Air and water flow rates have been specified and compared to central equipment output capacities.
 - b. Identify discontinuities and omissions in the Contract Documents.
 - c. This review of the Contract Documents by the TAB Subcontractor satisfies requirements for a design review report as specified in Division 23 Section "Testing Adjusting & Balancing for HVAC & Plumbing."
 - d. Assist performing functional performance tests.
2. Additional Responsibilities: Participate in tests specified in Division 23 Sections "Instrumentation & Controls of HVAC & Plumbing Systems."

F. Electrical Contractor:

1. With the Mechanical Contractor, coordinate installations and connections between and among electrical and HVAC systems, subsystems, and equipment.
2. Attend TAB verification testing.

1.5 COMMISSIONING DOCUMENTATION

- A. The following are in addition to documentation specified in Division 01 Section "General Commissioning Requirements."
- B. Test Checklists: CxA with assistance of Contractor shall develop test checklists for HVAC systems, subsystems, and equipment, including interfaces and interlocks with other systems. CxA shall prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. In addition to the requirements specified in Division 01 Section "General Commissioning Requirements," checklists shall include, but not be limited to, the following:
 1. Calibration of sensors and sensor function.

2. Testing conditions under which test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of test.
3. Control sequences for HVAC systems.
4. Strength of control signal for each set point at specified conditions.
5. Responses to control signals at specified conditions.
6. Sequence of response(s) to control signals at specified conditions.
7. Electrical demand or power input at specified conditions.
8. Power quality and related measurements.
9. Expected performance of systems, subsystems, and equipment at each step of test.
10. Narrative description of observed performance of systems, subsystems, and equipment. Notation to indicate whether the observed performance at each step meets the expected results.
11. Interaction of auxiliary equipment.
12. Issues log.

1.6 SUBMITTALS

- A. The following submittals are in addition to those specified in Division 01 Section "General Commissioning Requirements."
- B. Testing Procedures: CxA shall submit detailed testing plan, procedures, and checklists for each series of tests. Submittals shall include samples of data reporting sheets that will be part of the reports.
- C. Certificate of Readiness: CxA shall compile certificates of readiness from Contractor certifying that systems, subsystems, equipment, and associated controls are ready for testing.
- D. Certificate of Completion of Installation, Prestart, and Startup: CxA shall certify that installation, prestart, and startup activities have been completed. Certification shall include completed checklists provided by TAB Subcontractor as specified in Division 23 Section "Testing Adjusting & Balancing for HVAC & Plumbing."
- E. Test and Inspection Reports: CxA shall compile and submit test and inspection reports and certificates, and shall include them in systems manual and commissioning report.
- F. Corrective Action Documents: CxA shall submit corrective action documents.
- G. Certified TAB Reports: CxA shall submit verified, certified TAB reports.

1.7 ALTERNATES

- A. Refer to Division 01 Section, "Alternates" for description of work under this section affected by alternates.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Prerequisites for Testing:

1. Certify that HVAC systems, subsystems, and equipment have been completed, calibrated, and started; are operating according to the Contract Documents; and that Certificates of Readiness are signed and submitted.
2. Certify that HVAC instrumentation and control systems have been completed and calibrated; are operating according to the Contract Documents; and that pretest set points have been recorded.
3. Certify that TAB procedures have been completed, and that TAB reports have been submitted, discrepancies corrected, and corrective work approved.
4. Test systems and intersystem performance after approval of test checklists for systems, subsystems, and equipment.
5. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
6. Verify each operating cycle after it has been running for a specified period and is operating in a steady-state condition.
7. Inspect and verify the position of each device and interlock identified on checklists. Sign off each item as acceptable, or failed. Repeat this test for each operating cycle that applies to system being tested.
8. Check safety cutouts, alarms, and interlocks with duct detectors and life-safety systems during each mode of operation.
9. Annotate checklist or data sheet when a deficiency is observed.
10. Verify equipment interface with monitoring and control system and TAB criteria; include the following:
 - a. All temperature alarms.
 - b. All pump status alarms.
 - c. Supply and return flow rates for VAV and constant volume systems in each operational mode.
 - d. Operation of heat pump units in both heating and cooling cycles.
 - e. Minimum outdoor-air intake in each operational mode and at minimum and maximum airflows.
 - f. Total exhaust airflow and total outdoor-air intake.
 - g. Evaporator cooler flow rates, temperature, set points, and safeties.
 - h. Closed circuit supply and return flow rates for water to air heat pump systems in each operational mode.
 - i. Operation of water to water heat pumps in both heating and cooling cycles.
 - j. Minimum outdoor-air intake in each operational mode and at minimum and maximum airflows.
 - k. Supply, outside air, exhaust and return air flow rates for ERVs in each operating mode.

- l. Kitchen ventilation supply and exhaust air flow rates and temperatures, including optical and exhaust sensors.
 - m. Pump flow rates, pressure and amperage at each operating mode.
 - n. Sequences of operation of all HVAC equipment.
 - o. Ductless heat pumps and air conditioning units with air flow rates, fluid flow rates, and temperatures.
 - p. Variable speed drive parameters at each operated mode.
 - q. Duct dryer booster air flow rates, amperage, and set point.
 - r. Electric heating equipment volts, amps, and temperature rise.
 - s. Boiler temperatures, flow rates, low water cut-off interlock, flame failure interlocks, and amperage.
 - t. Supply and return air flow rates for all HVAC equipment.
 - u. Operation/Accuracy of flow measuring stations at various flow rates.
 - v. Operation of variable refrigerant flow systems in all modes.
 - w. Fluid flow rates and temperature for all water cooled equipment.
 - x. Set point and operation of "high temperature" alarms.
 - y. Test operation and air temperatures of hot gas re-heat coils.
 - z. Set point and operation of high temperature alarms.
 - aa. Test heat pump, boiler and swimming pool dehumidification unit flow switches.
 - bb. Test freeze protection pumps.
11. Verify proper responses of monitoring and control system controllers and sensors to include the following:
- a. For each controller or sensor, record the indicated monitoring and control system reading and the test instrument reading. If initial test indicates that the test reading is outside of the control range of the installed device, check calibration of the installed device and adjust as required. Retest malfunctioning devices and record results on checklist or data sheet.
 - b. Report deficiencies and prepare an issues log entry.
12. Verify that HVAC equipment field quality-control testing has been completed and approved. CxA shall direct, witness, and document field quality-control tests, inspections, and startup specified in individual Division 23 Sections.
- B. Testing Instrumentation: Install measuring instruments and logging devices to record test data for the required test period. Instrumentation shall monitor and record full range of operating conditions and shall allow for calculation of total capacity of system for each mode of operation. For individual room cooling tests, provide temporary heaters to impose a cooling load. Operational modes include the following:
1. Heating/Cooling Mode.
 2. Occupied and unoccupied.
 3. Warm up and cool down.
 4. Emergency power supply.
 5. Life-safety and safety systems.
 6. Duct detectors.
 7. Fire safety.
 8. Temporary upset of system operation.
 9. Partial occupancy conditions.

10. Special cycles.
11. ERV supply/exhaust air flow at partial CO2 levels.
12. Variable refrigerant volume units in heating/cooling modes.
13. Lead/lag standby modes where redundant equipment is indicated.
14. All alarms.
15. Kitchen make-up air unit and exhaust air fan at full, partial, and minimum air flow rates.
16. Flow switch shut-down and alarm.
17. Condensate overflow safety switch shut-down and alarm.
18. Condensate pump operation.

3.2 TAB VERIFICATION

- A. TAB Subcontractor shall coordinate with CxA for work required in Division 23 Section "Testing Adjusting & Balancing for HVAC & Plumbing." TAB Subcontractor shall copy CxA with required reports, sample forms, checklists, and certificates.
- B. Contractor, HVAC Contractor, and CxA shall witness TAB Work.
- C. TAB Preparation:
 1. TAB Subcontractor shall provide CxA with data required for "Pre-Field TAB Engineering Reports" specified in Division 23 Section "Testing Adjusting & Balancing for HVAC & Plumbing."
 - a. CxA shall use this data to certify that prestart and startup activities have been completed for systems, subsystems, and equipment installation.
- D. Verification of Final TAB Report:
 1. CxA shall select, at random, 10 percent of report for field verification.
 2. CxA shall notify TAB Subcontractor 10 days in advance of the date of field verification; however, notice shall not include data points to be verified. The TAB Subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
 3. Failure of an item is defined as follows:
 - a. For all readings a deviation of more than 10 percent.
 4. Failure of more than 10 percent of selected items shall result in rejection of final TAB report.
- E. If deficiencies are identified during verification testing, CxA shall notify the HVAC Contractor and Architect, and shall take action to remedy the deficiency. Architect shall review final tabulated checklists and data sheets to determine if verification is complete and that system is operating according to the Contract Documents.
- F. CxA shall certify that TAB Work has been successfully completed.

3.3 TESTING

- A. Test systems and intersystem performance after test checklists for systems, subsystems, and equipment have been approved.
- B. Perform tests using design conditions whenever possible.
 - 1. Simulate conditions by imposing an artificial load when it is not practical to test under design conditions and when written approval for simulated conditions is received from CxA. Before simulating conditions, calibrate testing instruments. Set and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
 - 2. Alter set points when simulating conditions is not practical and when written approval is received from CxA.
 - 3. Alter sensor values with a signal generator when design or simulating conditions and altering set points are not practical. Do not use sensor to act as signal generator to simulate conditions or override values.
- C. Scope of HVAC Contractor Testing:
 - 1. Testing scope shall include entire HVAC installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. It shall include measuring capacities and effectiveness of operational and control functions.
 - 2. Test all operating modes, interlocks, control responses, responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. Detailed Testing Procedures: CxA, with HVAC Contractor, TAB Subcontractor, and HVAC Instrumentation and Control Contractor, shall prepare detailed testing plans, procedures, and checklists for HVAC systems, subsystems, and equipment.
- E. HVAC Instrumentation and Control System Testing:
 - 1. Field testing plans and testing requirements are specified in Division 23 Section "Instrumentation & Controls of HVAC & Plumbing Systems". The CxA, HVAC Contractor, Equipment Provider/Manufacturer and the HVAC Instrumentation and Control Contractor shall collaborate to prepare testing plans.
 - 2. CxA shall convene a meeting of appropriate entities to review test report of HVAC instrumentation and control systems.
- F. Energy Supply System Testing: HVAC Contractor shall prepare a testing plan to verify performance of gas systems and equipment. Plan shall include the following:
 - 1. Sequence of testing and testing procedures for each equipment item and pipe section to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in system testing plan.
 - 2. Tracking checklist for managing and ensuring that all pipe sections have been tested.

- G. Heat-Generation System Testing: HVAC Contractor shall prepare a testing plan to verify performance of air handling units, dual temperature system, condenser water system, heat pumps, heat exchangers, condensate receivers, auxiliary equipment, energy recovery ventilators, energy recovery modules, variable refrigerant volume units, unit heaters, radiant heat panels, hot gas re-heat coils. Plan shall include the following:
1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
 2. Tracking checklist for managing and ensuring that all pipe sections have been tested.
 3. Variable refrigerant flow equipment volts, amps, temperatures, fluid flow rates, and modes of operation.
- H. Refrigeration System Testing: HVAC Contractor shall prepare a testing plan to verify performance of dual temperature system, condenser water system, heat pumps, refrigerant compressors, condensers, variable refrigerant volume systems, ductless units, closed circuit, evaporator cooling units and other refrigeration systems. Plan shall include the following:
1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
 2. Tracking checklist for managing and ensuring that all pipe sections have been tested.
 3. Variable refrigerant flow equipment volts, amps, temperatures, fluid flow rates, and modes of operation.
- I. HVAC Distribution System Testing: HVAC Contractor shall prepare a testing plan to verify performance of air, air handling units, and hydronic distribution systems, special exhaust ERV unit supply and exhaust, kitchen ventilation systems, and other distribution systems. Include HVAC terminal equipment and unitary equipment. Plan shall include the following:
1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
 2. Tracking checklist for managing and ensuring that all pipe sections have been tested.
 3. Equipment, air flow rates, air temperatures, fluid flow rates, safeties, freeze protection pump operation, and demand controlled ventilation.
- J. Deferred Testing:
1. If tests cannot be completed because of a deficiency outside the scope of the HVAC system, the deficiency shall be documented and reported to Owner. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.
 2. If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed and documented and additional tests scheduled.

K. Testing Reports:

1. Reports shall include measured data, data sheets, and a comprehensive summary describing the operation of systems at the time of testing.
2. Include data sheets for each controller to verify proper operation of the control system, the system it serves, the service it provides, and its location. For each controller, provide space for recording its readout, the reading at the controller's sensor(s), plus comments. Provide space for testing personnel to sign off on each data sheet.
3. Prepare a preliminary test report. Deficiencies will be evaluated by Architect to determine corrective action. Deficiencies shall be corrected and test repeated.

END OF SECTION

DIVISION 01
SECTION 019116
ELECTRICAL SYSTEMS COMMISSIONING REQUIREMENTS
TABLE OF CONTENTS

PART 1 GENERAL

- 1.1 RELATED DOCUMENTS
- 1.2 SUMMARY
- 1.3 DEFINITIONS
- 1.4 CONTRACTOR'S RESPONSIBILITIES
- 1.5 COMMISSIONING DOCUMENTATION
- 1.6 SUBMITTALS
- 1.7 ALTERNATES

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

- 3.1 TESTING PREPARATION
- 3.2 TESTING

SECTION 019116 – ELECTRICAL SYSTEMS COMMISSIONING REQUIREMENTS

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 requirements for commissioning the electrical system and its subsystems and equipment. This Section supplements the general requirements specified in Division 01 Section "General Commissioning Requirements."
- B. Related Sections include the following:
 - 1. Division 01 Section "General Commissioning Requirements" for general requirements for commissioning processes that apply to this Section.
- C. The following systems and/or equipment shall be commissioned:
 - 1. Lighting Control System(s)
 - a. Network lighting control system
 - b. Occupancy sensor based lighting controls
 - c. Relay based Lighting Control System

1.3 DEFINITIONS

- A. Architect: Includes Architect identified in the Contract for Construction between Owner and Contractor, plus consultant/design professionals responsible for design of electrical systems, electrical, communications, and other related systems.
- B. CxA: Commissioning Authority.
- C. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.

1.4 CONTRACTOR'S RESPONSIBILITIES

- A. The following responsibilities are in addition to those specified in Division 01 Section "General Commissioning Requirements."

B. Electrical Contractor:

1. Provide certified and calibrated measuring instruments and logging devices to record test data, and data acquisition equipment to record data for the complete range of testing for the required test period.

C. Electrical Contractor:

1. With the Mechanical Contractor, coordinate installations and connections between and among electrical and HVAC systems, subsystems, and equipment.
2. Attend TAB verification testing.

1.5 COMMISSIONING DOCUMENTATION

A. The following are in addition to documentation specified in Division 01 Section "General Commissioning Requirements."

B. Test Checklists: CxA with assistance of Contractor shall develop test checklists for electrical systems, subsystems, and equipment, including interfaces and interlocks with other systems. CxA shall prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. In addition to the requirements specified in Division 01 Section "General Commissioning Requirements," checklists shall include, but not be limited to, the following:

1. Calibration of sensors and sensor function.
2. Testing conditions under which test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of test.
3. Control sequences for electrical and emergency generator systems.
4. Strength of control signal for each set point at specified conditions.
5. Responses to control signals at specified conditions.
6. Sequence of response(s) to control signals at specified conditions.
7. Electrical demand or power input at specified conditions.
8. Power quality and related measurements.
9. Expected performance of systems, subsystems, and equipment at each step of test.
10. Narrative description of observed performance of systems, subsystems, and equipment. Notation to indicate whether the observed performance at each step meets the expected results.
11. Interaction of auxiliary equipment.
12. Issues log.

1.6 SUBMITTALS

A. The following submittals are in addition to those specified in Division 01 Section "General Commissioning Requirements."

- B. Testing Procedures: CxA shall submit detailed testing plan, procedures, and checklists for each series of tests. Submittals shall include samples of data reporting sheets that will be part of the reports.
- C. Certificate of Readiness: CxA shall compile certificates of readiness from Contractor certifying that systems, subsystems, equipment, and associated controls are ready for testing.
- D. Certificate of Completion of Installation, Prestart, and Startup: CxA shall certify that installation, prestart, and startup activities have been completed.
- E. Test and Inspection Reports: CxA shall compile and submit test and inspection reports and certificates, and shall include them in systems manual and commissioning report.
- F. Corrective Action Documents: CxA shall submit corrective action documents.

1.7 ALTERNATES

- A. Refer to Division 01 Section, "Alternates" for description of work under this Section affected by alternates.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

- A. Prerequisites for Testing:
 - 1. Certify that electrical systems, subsystems, and equipment have been completed, calibrated, and started; are operating according to the Contract Documents; and that Certificates of Readiness are signed and submitted.
 - 2. Certify that electrical instrumentation and control systems have been completed and calibrated; are operating according to the Contract Documents; and that pretest set points have been recorded.
 - 3. Test systems and intersystem performance after approval of test checklists for systems, subsystems, and equipment.
 - 4. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
 - 5. Verify each operating cycle after it has been running for a specified period and is operating in a steady-state condition.
 - 6. Inspect and verify the position of each device and interlock identified on checklists. Sign off each item as acceptable, or failed. Repeat this test for each operating cycle that applies to system being tested.
 - 7. Check safety cutouts, alarms, and interlocks with life-safety systems during each mode of operation.

8. Annotate checklist or data sheet when a deficiency is observed.
9. Verify proper responses of monitoring and control system controllers and sensors to include the following:
 - a. For each controller or sensor, record the indicated monitoring and control system reading and the test instrument reading. If initial test indicates that the test reading is outside of the control range of the installed device, check calibration of the installed device and adjust as required. Retest malfunctioning devices and record results on checklist or data sheet.
 - b. Report deficiencies and prepare an issues log entry.

3.2 TESTING

- A. Test systems and intersystem performance after test checklists for systems, subsystems, and equipment have been approved.
- B. Perform tests using design conditions whenever possible.
 1. Simulate conditions by imposing an artificial load when it is not practical to test under design conditions and when written approval for simulated conditions is received from CxA. Before simulating conditions, calibrate testing instruments. Set and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- C. Scope of Electrical Contractor Testing:
 1. Testing scope shall include entire electrical installation, from incoming service through distribution systems to each space. It shall include measuring voltages and currents and effectiveness of operational and control functions.
 2. Test all operating modes, interlocks, control responses, responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. Detailed Testing Procedures: CxA, with Electrical Contractor shall prepare detailed testing plans, procedures, and checklists for electrical systems, subsystems, and equipment.
- E. Electrical System Testing: Electrical Contractor shall prepare a testing plan to verify performance of systems identified under Part 1 of this Section. Plan shall include the following:
 1. Sequence of testing and testing procedures for each item of equipment and section of wiring to be tested, identified by identification marker. Markers shall be keyed to Drawings for each wiring sector showing the physical location of each item of equipment and electrical wiring test section. Drawings shall be formatted to allow each item of equipment and section of wiring to be physically located and identified when referred to in the system testing plan.
 2. Tracking checklist for managing and ensuring that all wiring systems have been tested.
- F. Deferred Testing:

1. If tests cannot be completed because of a deficiency outside the scope of the electrical system, the deficiency shall be documented and reported to Owner. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.
2. If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed and documented and additional tests scheduled.

G. Testing Reports:

1. Reports shall include measured data, data sheets, and a comprehensive summary describing the operation of systems at the time of testing.
2. Include data sheets for each electrical systems to verify proper operation of the electrical systems, the system it serves, the service it provides, and its location. Provide space for testing personnel to sign off on each data sheet.
3. Prepare a preliminary test report. Deficiencies will be evaluated by Architect to determine corrective action. Deficiencies shall be corrected and test repeated.

END OF SECTION