ADDENDUM #1:

Waynesville Performing Arts Center

Wayne Local School District
Waynesville, Ohio

659 Dayton Road
Waynesville, Ohio 45068

Prepared by:

LWC Incorporated
434 E. First Street
Dayton, Ohio 45402
(937 223-6500

Consultants:

Burkhardt Inc.
28 N. Cherry St.
Germantown, OH
937-388-0060

GOP Limited
644 Linn St. Suite 936
Cincinnati, OH
937-224-0861

CMTA Engineering
1650 Lake Shore Dr.
Suite 380
Columbus, Ohio 43204
614-992-1500

March 15, 2021

The contents of this Addendum shall become a part of the Contract Documents as if originally incorporated therein and as stated in Section 007100 – Contracting Definitions.

Item No. 1: Pre-bid Meeting:

1. See notes and sign-in sheet from the pre-bid meeting of March 10, 2021 attached to this Addendum.

Item No. 2: RFI's and Responses

1. See a list of requests for information and related responses attached to this addendum.

2. Estimate of the Building Permit Fee is $18,802.45. This does not include other permits such as electrical, HVAC, and Fire Alarm/Suppression. See the Warren County Building and Zoning website: https://www.co.warren.oh.us/bldginsp/BuildingElectrical/FeeCommercial.aspx

Item No. 3: Division 2-14 Substitutions:

Subject to compliance with requirements, the following may be incorporated into the work:

1. Section 042510: Nawkaw Corp.
2. Secontion 072400: LiteCore, Division of PolyCore, Bloomington, Indiana
3. Section 074213.13: Pac-Clad, Peterson Aluminum Corp., 7.2 panel, 22 gage
4. Section 077100, 2,2 Copings: Architectural Products Company, coping.
5. Section 077100, 2,5 Copings: Architectural Products Company, AP Flat Face Snap-Tight Coping, aluminum, welded for curve.
6. Section 102800: World Dryer, SLIMdri #L-973A
7. Section 116001: StageRight Corporation, Opus II Ceiling Panels with painted finish (color as directed by Architect), custom curve to match project requirements.
8. Section 0

Item No. 4: Specifications Divisions 0-14

1. Specification Section 000800 – Supplementary Conditions: See this section attached to this addendum.
2. Specification Section 012100 – Allowances: See this section attached to the addendum which changes the Contingency Allowance to a Lump Sum Allowance.
3. Specification Section 028214 – Hazardous Materials Survey: The hazardous materials survey is included in this addendum for reference.
4. Specification Section 042000 – Unit Masonry: To Section 2.7, Stone Trim Units, add the following for granite stone trim units:
   a. Material Standard: Comply with ASTM C 615.
   b. Description: Uniform, medium-grained, black stone without veining with polished finish equal t Mesabi Black.
5. Specification Section 081416 – Flush Wood Doors: See this section attached to this addendum.

Item No. 5: Drawings

1. Sheet A001: Sheet A001 in the addendum replaces original sheet with existing doors corrected.
2. Sheets A101 and 102: Sheets A101 and A102 in this addendum replace original sheets. Loose furniture has been removed to make clear what seating is part of the scope.
3. Sheets A501, A502, A504, and A505: Sheets A501, A502, A504, and A505 in this addendum replace the original sheets. This changes the exterior limestone base to granite.
4. Sheet A702: Sheet A702 in this addendum replaces the original A702. Corrects stage rigging table, plan, and section.
5. Sheet ID101 and ID102: Sheets ID101 and ID102 in this addendum replace original sheets. Corner guards have been added.

Item No. 6: GOP Structural Addendum Items

1. None

Item No. 7: CMTA Plumbing, Mechanical, Electrical, and Technology Engineering Addendum Items

1. See attached write up, specifications, and drawings from CMTA which are a part of this addendum.

End of Addendum 1

PRE-BID MEETING AGENDA

MEETING DATE:	March 10, 2021
PROJECT NAME:	New Waynesville Performing Arts Center
COMMISSION NO.:	18620.00

ATTENDEES:

See attached sign in sheet.

INTRODUCTIONS:

Introduction of the Team present.

SIGN IN SHEET:

All participants are required to sign in with contact phone and email. Please print legibly, we cannot be responsible for misdirected email because of an illegible email address.

BIDDING SCHEDULE:

Bids are due March 25, 2021, 2:00 PM.

Bids are to be submitted to the Board office, and upon receipt of the bids they will be read aloud in the Spartan Room.

CONSTRUCTION SCHEDULE:

Construction Starts: August 2, 2021

Substantial Completion: July 29, 2022

PROJECT DESCRIPTION:

The project includes construction of a new Performing Arts Center addition of approximately 14,670 SF with related sitework, and remodeling of approximately 24,990 SF, and other Work indicated in the Contract Documents.

DELIVERY METHOD:

Single Prime Contract.

PROCEFURES FOR RFI'S AND SUBSTITUTIONS:

Submit all RFI's in writing to Ed Soots esoots@lwcinspires.com.

RFI's and substitution requests are due to LWC 10 days prior to bid date.

DISTRIBUTION OF CONTRACT DOCUMENTS:

Documents are available on the LWC FTP. Call either Sherry Jeffers of Ed Soots to receive access to the FTP.

SITE ACCESS:

Site access will be from a temporary road off Dayton Road that is installed in previous contract. Limit use of Project site to areas within the Contract limits indicated on the drawings by the Contract limits.

Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

There will be a lay-down area with base asphalt for utilization and the responsibility of the Contractor to maintain.

SECURITY:

The site shall remain secure and inaccessible by the public, staff or students at all times.

Smoking or tobacco products, controlled substances and alcoholic beverages are not permitted on the Project Site.

WORK HOURS:

Normal working hours between 6 AM and 6 PM unless specifically permitted.

QUESTIONS AND ANSWERS:

This is not a prevailing wage project.

There will be no liquidated damages on this project.

Addendum 1 will be issued early next week. Addendum 2 will be issued prior to bids.

Scheduling site visits for the Contractors discussion.

- Site visits can be made next week 3/17 and 3/18 between the hours of 9:00-11:00. The Contractor shall enter the main entrance of the elementary school and sign in.

A question was asked if the 5% allowance can be made a lump sum.

The mechanical alternate; the drawings appear to be the same as basis of design.

Division 28 is included in the drawings.

It is shown that the work can begin prior to August 2. The intent is that site utilities and some minor work could begin.

This project is sales tax exempt.

Special inspections are contracted through the Owner.

The Contractor shall include the permit cost, LWC will submit for permit. An estimate of permit cost will be included in the Addendum.

None of the existing space will be occupied during construction, it is the wish of the Owner to get the Board offices ahead of completion if possible.

An abatement report has been requested by the Contractors.

Confirmation on aid to construction will need to be in the next Addendum.

WAYNE LOCAL SCHOOL DISTRICT
Waynesville Performing Arts Center
Project No. 18620.00

March 15, 2021

Addendum #1 RFI Log

1. I see Section 101100 Visual Display Units but I do not see any called out on the drawings. Can you clarify? **A: See Detail 17 on A601. Tackboard between shelf brackets.**
2. Is this project subject to liquidated damages? **A: No**
3. What are the retainage terms for progress payments? **A: 10% for first 50%.**
4. What are the insurance requirements for this project? **A: See Addendum 1**
5. Is this PW and tax exempt? **A: There is no prevailing wage. The project is sales tax exempt. The successful contractor will be given the necessary documentation.**
6. Wood Door Specification – none found. **A: See Addendum 1**
7. Drawing # A001 (Door Schedule)
    a. Certain Door Numbers (EX; 109, 111A) calls out for "Existing", however, these openings look like they might be a New Wood Door in an Existing Frame with Existing Hardware.
        i. Please clarify if the above is correct? **A: These are existing wood doors with no additional work. Refer to updated drawings in Addendum 1.**
8. Do you know if you'll be issuing supplementary general conditions for the project? I didn't see those in the documents. **A: See Addendum 1.**
9. Is there fixed seating throughout the whole project? **A: No. Fixed seating is only at the tiers at the rear of the auditorium and at the balcony. These are all shown on Sheet A102. There are four rows of telescoping stands shown on Sheet A101. All other seating is loose and not in this contract.**
10. If there is telescoping bleachers does each section 126100 & 126600 need to be from the same manufacture? **A: They are not required to be from the same company.**
11. If there is not 352 total seats is the correct count 197 for fixed seating or is it 105 fixed seats with 92 telescoping seating/bleachers? **A: There are 155 fixed seats and 92 telescoping seats.**
12. Masonry: The base bid shows lightweight stone panels on the North Elevation. I don't see a specification section that lists the manufacturers. **A: 074200 – Natural Stone Reinforced Panels (Exterior)**
13. Is there a milestone schedule available for this project? **A: See Section –3113 – Preliminary Schedules.**
14. Sheet A301 note 11 says base granite, however detail 8 on A502 says limestone, please advise. **A: Will clarify in Addendum 1.**
15. Controls: M103 and M203 show an existing packaged RTU to remain but there is no sequence or points list for it. Is this RTU to be tied into the BAS as part of this project? If so, what existing controls are on it? Does it have existing manufacturer controls with a BACnet interface or does something new need to be provided? Please confirm controls scope for this existing RTU. **A: Addendum 1 revises M501 for points list to integrate into new BAS. Contractor to verify integration is possible with existing unit controls or provide new if required.**
16. Roofing: Can we get some info on the existing built up roof such as manufacturer, if its still under warranty etc? **A: There is no information on it. It appears to be a ballasted coal tar pit system. No warranty.**
17. Electrical: Can you please clarify if the use of MC cable is allowed? **A: See addendum 1.**

18. Electrical: In spec section 260501 1.22 D. there is a requirement that all work be completed exclusively by journeyman electricians. I imagine this is a mistake, but would like that clarified. **A: See addendum 1.**
19. Clarify Tap Fees – Water/Sanitary - if these have been waived. **A: No tap fee for Sanitary but there would be inspection fees paid by the contractor. There will be no tap fee for the domestic or fire protection water service, however, the contractor is responsible for all material, equipment, and meters related to it.**
20. Clarify that the contractor is not responsible for Aid to Construction – DPL. **A: Will clarify in Addendum 1.**
21. Clarify that the Contingency Allowance of 5% will be changed to a lump sum number provided by Architect **A: Will clarifiy in Addendum 1.**
22. (1) On sheet M203 Note M16 states roof duct to be Thermaduct or equal. Note M36 states hatched duct shall be internally lined with Kenetics KNM-100AL. Is the intent to have Thermaduct with kinetics internal lining for all duct on the roof? **A: All "new" roof ductwork shall be thermaduct, or equal, and shall be internally lined. Existing roof ductwork can remain as is.**
23. (2) Sheet M101 Note MD7 is this getting 2 panels one aluminum insulated and one galvanized with finished edge. **A: Yes, 2 panels. One insulated panel to seal the interior louver face, and another panel to cover the wall opening.**
24. (3)Does the school have a preferred control contractor. **A: No preference.**
25. (4) Sheet M103 there is a demo note MD14 but no explanation for this. **A: Note should read as "REMOVE EXISTING EXHAUST FAN, CURB, AND ASSOCIATED ELECTRICAL. ROOF OPENING SHALL BE REPAIRED SO AS TO NOT VOID ANY EXISTING ROOF WARRANTY." This note will be added to the drawings via an addendum.**
26. I don't see a Bid Bond Form included in the documents. Do you have a specific Bid Bond Form you would like us to use for this project, or is a standard AIA Bid Bond Acceptable? **A: Standard AIA Bid Bond form is acceptable.**
27. Fire Suppression: F102 & F104, shown as an Alternate Plan – is there a particular "Alternate" that this is applicable to? **A: See addendum 1.**
28. Section 11060 – Please clarify the line sets that are required for this project. Drawing A702 shows a rigging schedule, section/elevation, and plan view that each show a different total number of line sets and inconsistent numbering. **A: Revised Sheet A702 will be included in Addendum 1.**
29. Who is the manufacturer of the existing campus wide fire alarm system? **A: See addendum 1.**
30. Will this existing system be permitted to receive only alarm, trouble, or supervisory from the new fire alarm control panel in the new Performing Arts Center? **A: See addendum 1.**
31. Is BIM coordination required on this project? It is alluded to in the front ends but it's not clear if it's required or not. I found references to it in section 013100. **A: Due to the tight ceilings in some areas, we thought it would be best to include above ceiling coordination drawings to ensure everything is hashed out prior to install. We call for coordination drawings in Part 18 of spec section 200100. No other BIM coordination is needed other than that.**

END OF ADDENDUM #1 RFI LOG

SECTION 000800 - SUPPLEMENTARY CONDITIONS

The following Supplementary Conditions modify, change, delete or add to the General Conditions of the contract for Construction.

1. OHIO SALES AND USE TAX:

   The labor and materials furnished under this contract will be used, when the project is completed by the Owner for its tax exempt purposes. Accordingly, the Ohio Gross Retail and Use Tax (Sales and Use Tax) will not apply to the purchase of materials under this contract by the Owner from the Contractor. The Owner will issue an appropriate exemption certificate to the Contractor to that effect.

2. PREVAILING WAGE: This project does not include any prevailing wage requirements.

3. LIQUIDATED DAMAGES: This project does not include any liquidated damages provisions.

4. PAYMENTS TO CONTRACTORS:

   Monthly payments will be based on 90% of the value of the labor performed and materials incorporated into the building project since the preceding payment period, plus 90% of the value of the materials suitably stored and protected at the site ready for incorporation in the work. Applications for payment, subsequent to the first application, shall be accompanied by Affidavits and Waivers of Lien from the prime contractors and all major suppliers/subcontractors.

   Form of application for payment shall be AIA Document G-702, Application and Certificate for Payment, supported by AIA Document G703, Continuation Sheet, executed in same form as the Schedule of Values. Application shall be submitted in quintuplet including all supporting documentation.

   All contracts above two hundred thousand ($200,000) dollars must include a retainer. The retainer shall be placed in an escrow account with a bank, savings and loan organization, or the College, as selected mutually by both parties pursuant to a written agreement. The retainer to be withheld can be either:

   1. Ten percent (10%) of the dollar value of all satisfactory work completed up to fifty percent (50%) complete or
   2. Five percent (5%) of the dollar value until all work is completed.

   Within sixty-one (61) days following the date of substantial completion, the contractor shall be paid all escrow principal and income. However, if any work remains, two hundred percent (200%) of the value of each item value shall be retained.

   Bills of sale, vouchers or such other evidence to support the contractor's right to payment for the latter condition may be required for the Owner's protection. No material thus paid for to be removed from the premises without the Owner's permission.

   Contractor shall furnish, before the first application, a schedule of values of the various parts of the work aggregating the total sum of the contract. This schedule when approved by the A/E, shall be used as a basis for certificate of payment. In applying for payments, the contractor shall submit a statement based on this application, showing his right to the payment claimed. Application shall be made ten (10) days before payment is due.

   Final payment due and payable sixty-one (61) days following final completion and acceptance of work.

Final application for payment shall be accompanied by the following additional documents: AIA Document G706, Contractor's Affidavit of Payment of Debts and Claims; AIA Document G706A, Contractor's Affidavit of Release of Liens; AIA Document G707, Consent of Surety, Unconditional Final Waivers of Lien from all Sub-contractors and Suppliers and Final Conditional Waivers of Lien from the Prime Contractors.

5. INSURANCE REQUIREMENTS:

Add the following to Subparagraph 11.1.2 of Section 00700, General Conditions of the Contract for Construction.

OWNER'S LIABILITY INSURANCE:

The Owner shall be responsible for and at his option may maintain such insurance as will protect from his contingent liability to others for damages because of bodily injury, including death, which may arise from operations under the Contract, and any other liability for damages which the Contractor is required to insure under any provision of the Contract.

CONTRACTOR'S LIABILITY INSURANCE:

A. Each Contractor shall take out and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the work is located, insurance of such types and in such amounts as are necessary to protect the Contractor from claims set forth below which may arise of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable whether such operations be by the Contractor or by a subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

B. No Contractor shall commence work under this contract until he has obtained all insurance required under this Section and such insurance has been approved by the Owner, nor shall any Contractor allow any subcontractor to commence work on his subcontract until the required insurance has been obtained by the subcontractor and approved by the Owner. Each and every Contractor and Subcontractor shall maintain all insurance required under paragraph E of this Section for not less than one year after completion of this contract.

C. Contractor shall submit to the Architect four (4) copies of Certificates of Insurance for this review and the Owner's approval prior to commencement of the Work. The form of certificate preferred is AIA Document G705, Certificate of Insurance. Certificates shall include each and every type of coverage specified.

In the event the Contractor engages Subcontractor for all or a portion of the work required by this agreement, the Contractor will require any and all Subcontractors to also assume all of the duties, obligations and requirements in this Section. The Contractor shall require each Subcontractor to provide Certificates of Insurance evidencing the insurance required by this Section naming the Contractor and Owner (and Building Corporation if bid is assigned by Owner to Building Corporation) as Additional Insureds, except as respects Workers' Compensation Insurance and that insurance carried and maintained by the Subcontractor meets all the requirements of this Section.

D. If requested by the Owner, Contractor shall furnish the Owner with true copies of each policy required of him or his subcontractors. Said policies will not be cancelled or materially altered, except after thirty (30) days advance written notice to the Owner and Architect, mailed to the addresses indicated herein.

E. Liability insurance shall include all major divisions of coverage and be on a comprehensive basis including:

1. Premises' Operations (deleting any X-C or U exclusions).
2. Products and Completed Operations.
3. Contractual, including specific provisions for the Contractor's obligations under Paragraph I.
4. Owned, Non-Owned, and Hired motor vehicles.
5. Broad Form Property Damage including Completed Operations.

Except with respect to bodily injury and property damage included within the products and completed operations hazards, the aggregate limit where applicable shall apply separately to each project under this Contract.

Coverage shall be written on an "Occurrence" form unless otherwise approved by the Owner.

The Architect and the Owner (and Building Corporation if bid is assigned by Owner to Building Corporation) shall be named as additional Insureds under the Comprehensive General Liability Insurance policy or the Commercial General Liability Policy.

F. The insurance required by Paragraph E above shall be written for not less than any limits of liability shown on the "Schedule of Insurance Coverages Required" found herein, or required by law, whichever is greater.

SCHEDULE OF INSURANCE COVERAGES REQUIRED

TYPE OF INSURANCE		LIMITS OF LIABILITY	
		EACH OCCURRENCE	AGGREGATE
1. a) Workers' Compensation b) Employer's Liability	Statutory	$ 1,000,000/$500,000/$100,000	
2. Comprehensive General Liability Including: (X) Premises/Operations (X) Underground Explosion & Collapse Hazard (X) Products/Completed Opr. (X) Contractual Liability (X) Independent Contractors (X) Broad Form Prop. Damage (X) Personal Injury (X) Aggregate by Job Site Endorsement	BODILY INJURY PROPERTY DAMAGE BI & PD COMBINED PERSONAL INJURY	$ 1,000,000 $ 1,000,000 $ 1,000,000	$ 1,000,000 $ 1,000,000 $ 1,000,000
3. Comprehensive Automobile Liability (X) Any Auto (X) All Owned Autos (X) Hired Autos	BODILY INJURY (PER PERSON) BODILY INJURY (PER ACCIDENT) PROPERTY	$ 1,000,000 $ 1,000,000	

(X) Non-Owned Autos	DAMAGE	$ 1,000,000	
( ) _____	BI & PD	$ 1,000,000	
4. Excess Liability			
(X) Umbrella Form	BI & PD	$ 1,000,000	$ 1,000,000
( ) Other Than Umbrella Form	COMBINED		

5. Other (Specify)

H. If the Contractor's General Liability Insurance is provided by the Commercial Liability form (Occurrence Form), the Contractor's Automobile Liability Insurance shall include coverage for "Automobile Contractual Liability."

I. Hold Harmless Agreement

1. The Contractor shall indemnify and hold harmless the Owner and the Architect and their agents and employees from and against all claims, damages, losses and expenses including attorney's fee arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (including but not limited to the work) including the loss of use resulting therefrom, and (b) is caused in whole or in part by any negligent act or omission of the Contractor, any subcontractor, any one directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

2. In any and all claims against the Owner or the Architect or any of their agents or employees by an employee of the Contractor, Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Hold Harmless Agreement shall not be limited in any way by any limitation on the amount payable by or for the Contractor or any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefits acts.

3. The obligations of the Contractor under this Hold Harmless Agreement shall not extend to any claim, damage, loss or expense for which the Architect is legally liable arising out of professional services performed by the Architect, his agents, or employees, including (1) the preparation of maps, plans, opinions, reports, surveys, designs or specifications, and (b) periodic observation of the work or engineering services.

PROPERTY INSURANCE

A. The Contractor shall provide insurance coverage for portions of the Work stored off the site after written approval of the Owner at the value established in the approval, and also for portions of the work in transit.

B. Each Contractor shall make such provisions as he deems necessary to replace all items of his work missing by theft prior to acceptance of his work by the Owner.

BROAD FORM BUILDERS RISK COMPLETED VALUE INSURANCE

The Owner will effect and maintain Broad Form Builders Risk completed Value insurance or an

equivalent coverage covering all risks of physical loss. This insurance is to be upon all the structures on which the work of all the Contracts is to be done to one hundred percent of the insurable value thereof, including items of labor and materials connected therewith whether in or adjacent to the structures insured, materials in place or to be used as part of the permanent construction including surplus materials, shanties, protective fences, bridges, temporary structures, miscellaneous materials and supplies incident to the work, and such scaffoldings, stagings, towers, and equipment as are not owned or rented by the Contractor, the cost of which is included in the cost of the work. EXCLUSIONS: This insurance does not cover any tools owned by mechanics, any tools, equipment, scaffolding, staging, towers, and forms owned or rented by the Contractor, the capital value of which is not included in the cost of the work, or any structures erected for housing of food service for the workmen.

Said insurance, to be furnished by the Owner, shall insure the Owner's interest, shall insure the interest of all Contractors having a contract with the Owner, and shall also include all Subcontractors of each Contract. The Contractors shall be named or designated in such capacity as insured jointly with the Owner in all policies and all Subcontractors for each Contractor shall be included as insured jointly with the Contractors in all policies by designation, by name, or each of said Subcontractors, or by designation, "Subcontractors, as their respective interest may appear". Certificates of such insurance shall be filed with each of the Contractors and the Architect. If the Owner fails to effect or maintain insurance as above and so notifies the Contractor, the Contractor may insure his own interest and that of the subcontractors and charge the cost thereof to the Owner. If the Contractor is damaged by failure of the Owner to maintain such insurance or to so notify the Contractor he may recover as stipulated in the Contract for recovery of damages. If other special insurance not herein provided for is required by the Contractor, the Owner shall effect such insurance at the Contractor's expense by appropriate riders to his Builders Risk Insurance policy. The Owner, Contractors, and all subcontractors waive all rights, each against the other, for damages caused by fire or other perils covered by insurance provided under the terms of this article, except such rights as they may have to the proceeds of insurance held by the Owner as Trustee.

The loss, if any, is to be made adjustable with and payable to the Owner as Trustee for the insureds and Contractors and subcontractors as their interest may appear, except in such cases as may require payment of all or a portion of said insurance to be made to a mortgagee as his interest may appear.

The Owner shall be responsible for and at his option may insure against loss of use of his existing property, due to fire or otherwise however caused. If required in writing by any party in interest, the owner as Trustee shall, upon occurrence of loss, give bond for the proper performance of his duties. He shall deposit any money received from insurance in an account separate from all his other funds and he shall distribute it in accordance with such agreement as the parties in interest may reach. If after loss no special agreement is made, replacement of injured work shall be ordered and executed as provided under Subsection "CHANGES IN THE WORK".

The Trustee shall have power to adjust and settle any loss with the insurers unless one of the Contractors interested shall object in writing within three working days of the occurrence of loss.

6. CHANGES IN THE WORK:

1. Add the following to subparagraph 7.2.1:

In subparagraph 7.2.1 the allowance for overhead and profit combined, included in the total cost to the Owner, shall be based on the following schedule:

a. For the contractor, for the work performed by the contractor's own forces, fifteen percent (15%) of the cost.
b. For the contractor, for work performed by his subcontractor, five percent (5%) of the amount

due the subcontractor.

c. For each subcontractor or sub-subcontractor involved, for work performed by his own forces, fifteen percent (15%) of the cost.

d. For each subcontractor, for work performed by his sub-subcontractor, for work performed by his sub-subcontractors, five percent (5%) of the amount due the sub-subcontractors.

e. Cost to which overhead and profit is to be applied shall be determined in accordance with Section 012100 -Allowances.

f. In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontractors. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also. In no case will a change involving over $500.00 be approved without such itemization.

7. GUARANTEE:

Contractor shall guarantee in writing for a period of one year from the date of final acceptance of the work against any and all defects in materials and/or workmanship that should manifest themselves within that period. Installations that are defective shall be removed and replaced without expense to the owner and to his satisfaction.

8. PERMITS:

Payment of building permits is the responsibility of the Contractor per Section 3.7 of the General Conditions of the Contract.

9. ASBESTOS:

Contractors shall not use any asbestos containing materials for this project. At the end of the project, submit a certification to the A/E and Owner that no asbestos containing materials were used.

10. TOBACCO AND ALCOHOL:

Wayne Local School District has a strict policy prohibiting the use of tobacco of any kind or alcohol on school property. This policy extends to all construction personnel. Individuals who violate this policy will be asked to leave the jobsite.

END OF SECTION 000800

SECTION 012100 – ALLOWANCES – Addendum 1

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. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Contingency allowances.

C. Related Requirements:

1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
2. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
3. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.3 DEFINITIONS

A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.5 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.8 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs due to a change in the scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Contingency Allowance: Include a contingency allowance of $350,000.00 for use according to Owner's written instructions. (Addendum No. 1)

END OF SECTION 012100

SECTION 028214 - HAZARDOUS MATERIALS SURVEY

Pre-Demolition Hazardous Materials Survey

Waynesville Elementary
659 Dayton Road; Waynesville, Ohio 45068

April 17, 2019

Prepared By:

CTL Engineering, Inc.
2860 Fisher Road
Columbus, OH 43204

CTL Engineering of Ohio, Inc.
2860 Fisher Road, Columbus, Ohio 43204-3538
Phone: 614/276-8123 Fax: 614/276-6377
Email: ctl@ctleng.com

AN EMPLOYEE OWNED COMPANY

Consulting Engineers • Testing • Inspection Services • Analytical Laboratories

Established 1927

April 17, 2019

LWC, Inc.
434 E. First Street,
Dayton, OH 45402

Attention: Mr. Ed Soots, Senior Associate
Phone: (937) 223-6500
Email: ESoots@lwcinspires.com

Reference: Pre-Demolition Hazardous Materials Survey
Project Name: Waynesville Elementary
Project Location: 659 Dayton Road, Waynesville, OH, 45068
CTL Engineering Proposal No. 18510214COLa

Dear Mr. Soots:

In accordance with our contract, on behalf of **LWC, Inc.** (Client) and **Wayne Local School District**, CTL Engineering of Ohio, Inc. (CTL Engineering) performed a Hazardous Materials Survey for the Waynesville Elementary building located at 659 Dayton Road, in Warren County, Waynesville, Ohio 45068. This survey was performed due to planned demolition of the structure.

We appreciate the opportunity to provide these professional services. If you should have any questions regarding the attached report, or require any further information, please feel free to contact me at (614) 824-3527. Please refer to CTL Engineering Project No. 18510214COLa in all future inquiries. It was a pleasure working with you on this project.

Respectfully submitted,

CTL ENGINEERING of OHIO, INC.

Chris Rittenhouse
Asbestos Hazard Evaluation
Specialist #35305

TABLE OF CONTENTS

APPENDICES

1.0 EXECUTIVE SUMMARY

In accordance with our contract, on behalf of **LWC Inc.** (Client) and **Wayne Local School District**, CTL Engineering of Ohio, Inc. (CTL Engineering) performed a Hazardous Materials Survey for the Waynesville Elementary building located at 659 Dayton Road, in Warren County, Waynesville, Ohio 45068. This survey was performed due to the planned demolition of the structure.

Please note that the information provided in the Executive Summary is a brief summary of the findings and should be read in conjunction with the entire report.

Asbestos-containing Materials

The following building materials have been confirmed to contain asbestos concentrations in excess of the EPA regulatory threshold of >1.0%:

HSA	Description	Location	Condition	EPA Classification	Est. Quantity
3, 72	Brown Ceiling Tile Mastic (Assoc. with 1'x1' Ceiling Tile)	Throughout 1952 Addition, Cafeteria Area	Good	Cat II NF	22,000 SF
7, 15, 17, 22, 23, 29, 33,	Resilient Floor Tile Various Colors & Styles	Throughout	Good	Cat I NF	40,950 SF
	Resilient Floor Tile Various Colors & Styles (Under Carpet)	1915 Addition – 2nd Floor Hall, Room 211	Good	Cat I NF	1,550 SF
*	Hard Plaster Finish and Base Coat	1915 Addition 3rd Floor Walls Ceilings, Stairwell	Good	RACM	15,000 SF
*	Pipe Insulation	Throughout – Assumed to be Hidden within Walls/Above Ceilings/Beneath Floors/ Pipe Chases	N/A	RACM	1,800 LF
*	Mud Fittings				500 Ea.
20	Transite Window Panels	1915 Addition	Good	Cat II NF	900 SF / 90 Ea.
83	White Door & Window Caulk	Doors & Windows-1956/57 Addition	Good	Cat II NF	40 SF / 40 Openings
89, 91	White/Gray Concrete Seam Caulk	Cafeteria Area on Exterior Brick	Good	Cat II NF	3 SF

RACM – Regulated Asbestos-containing material; Cat I NF – Category I nonfriable; Cat II NF – Category II nonfriable; LF – Linear-feet; SF – Square-feet; Ea – Each

*Hard Plaster Finish and Base Coat, as well as Pipe Insulation and Mud Fittings were identified as confirmed asbestos-containing in the previous reports from Tackett Environmental Services, Inc. (Appendix D).

All asbestos-containing materials that will be disturbed during the demolition should be removed and disposed of by a licensed asbestos abatement contractor in accordance with the Asbestos NESHAPS, 40 CFR Part 61, and the OSHA Asbestos in Construction Standard, 29 CFR 1926.1101.

Assumed Asbestos-containing Materials

The following suspect materials, identified via field observations or review of the original construction drawings, were either inaccessible for sampling or would have required destructive sampling techniques, and, therefore, were not sampled.

These materials should be assumed to contain asbestos and removed by a licensed asbestos abatement contractor if they will be disturbed during demolition unless they are first sampled by a licensed Asbestos Hazard Evaluation Specialist and determined not to be ACMs by laboratory analysis.

Description	Location	Condition	EPA Classification	Total Est. Quantity
Roofing Tars and Flashings	Roof Area	Good	Cat I NF	36,500 SF
Board mastic	Throughout	Good	Cat II NF	5,000 SF
Fire doors/ Solid Core Doors	Throughout	Good	Cat II NF	54 EA
Boiler Internal Components / Gaskets	Boiler Room	N/A	RACM	2 Units
Vibration Dampener	Music Storage Room, Kitchen	Good	Cat II NF	24 SF

RACM – Regulated Asbestos-containing material; Cat I NF – Category I nonfriable; Cat II NF – Category II nonfriable; LF – Linear-feet; SF – Square-feet; EA – Each

Materials with Asbestos Concentrations of 1% or Less

The following materials were reported to contain asbestos in concentrations less than the EPA regulatory threshold of >1%:

HSA	Sample Nos.	Description	Location	Condition	Est. Quantity
18, 35	18 A-E, 35 A-G	Hard Plaster	1915 Addition	Good	30,000 SF
19	19 A-E	Ceiling Texture II	1915 Addition – Art Storage	Good	400 SF

HSA – Homogeneous Sample Area; SF – Square-feet

Materials with concentrations of asbestos equal to or less than 1% do not meet the definition of an asbestos-containing material per the Asbestos NESHAPS, and are not regulated by the EPA. However, portions of the OSHA Asbestos in Construction Standard, 29 CFR 1926.1101, still apply to the management of these materials.

Other Hazardous Materials

Lead-based Paint - Based on the age of construction, it is assumed that lead-based paint is present. All contractors involved in the demolition project should be notified of the likely presence of lead-based coatings in accordance with the OSHA Lead in Construction Standard, 29

CFR 1926.62. All aspects of the OSHA Lead in Construction Standard will apply during any activities that may disturb painted/coated building components.

Universal Waste Lamps: Universal waste lamps, primarily fluorescent tubes, are present throughout the building (Estimated 1,800). All universal waste lamps should be removed prior to demolition and recycled in accordance with the Ohio EPA's rules governing the disposal of Universal Wastes (OAC 3745-273).

PCB-containing Equipment: Oils associated with fluorescent light ballasts located throughout the subject building may contain Polychlorinated Biphenyls **(**PCBs) (Estimated 600). All light ballasts that will be removed during the project should be inspected for labels indicating their PCB content, or a date stamp indicating the year of their manufacture. Ballasts without a "Non-PCB" label or with a date stamp of 1980 or prior should be assumed to contain PCBs. Non PCB-containing light ballasts may be recycled or disposed of at a solid waste landfill. Intact PCB-containing ballasts may be disposed of at a solid waste landfill. Any leaking PCB-containing ballasts must be disposed of in an approved incinerator or landfill in accordance with the Toxic Substance Control Act (TSCA, 40 CFR Part 761).

Mercury-containing Equipment: Mercury-containing ampoules were observed in Boiler Room gauges (Estimated 3 gauges). No evidence of spilled mercury was observed. The mercury-containing ampoules and any other mercury-containment equipment that will be removed during demolition should be handled in accordance with the Ohio EPA's rules governing the disposal of Universal Wastes (OAC 3745-273).

Refrigerant-containing Equipment – Refrigerant-containing equipment including, but not limited to, water coolers, air conditioning units, HVAC units, refrigerators and freezers are present in the building. If these items will not be re-used, they should be removed prior to demolition and the refrigerants should be evacuated in accordance with all applicable EPA regulations on refrigerant handling, recycling, and recovery with certified personnel and equipment.

Miscellaneous Chemicals – Cleaning products, maintenance products and other miscellaneous chemicals are present in the building. If these materials are not to be re-used, they should be characterized and disposed of in accordance with applicable hazardous waste disposal regulations (40 CFR Part 261).

2.0 INTRODUCTION

In accordance with our contract, on behalf of **LWC Inc.** (Client) and **Wayne Local School District**, CTL Engineering of Ohio, Inc. (CTL Engineering) performed a Hazardous Materials Survey for the Waynesville Elementary building located at 659 Dayton Road, in Warren County, Waynesville, Ohio 45068. This survey was performed due to the planned demolition of the structure.

3.0 SITE DESCRIPTION

The subject building is a two-story masonry structure that totals approximately 90,124 square-feet of floor space. Based on the information provided by the Client, the building was originally constructed in 1915 which consists of 3 floors. Various additions were constructed in the 1950's as well as an office area added in 1999. Floors consist of concrete with a combination of Resilient Floor Tile, Carpet, Terrazzo and wood floor coverings. Walls consist mostly of block and plaster with additions that include areas of drywall. Ceilings are a combination of lay-in tile, tile and mastic, and plaster.

4.0 ASBESTOS SURVEY METHODOLOGY

The asbestos survey was conducted in accordance with the applicable regulations and general guidelines set forth in EPA's *Asbestos Hazardous Emergency Response Act* (AHERA), 40 CFR 763, Subpart E. Specifically, the project included the following tasks:

- An attempt to collect and review any existing building plans and/or drawings, previous asbestos surveys, and related information indicating the presence or location of ACMs in the building.

- Survey of the buildings by a licensed Asbestos Hazardous Evaluation Specialist(s), as per OAC Rule 3745-22. The survey included a visual and physical examination of building materials to identify locations of known and/or suspect ACMs.

- Suspect materials were classified as homogeneous, according to their location within the building, installation date, color, texture, and/or hardness, as suggested by current EPA sampling protocols. The suspect materials were then divided into Homogenous Areas (HAs) and each sample collected was identified with a unique sample identifier. The number of samples to be collected was determined according to the following criteria:

    - **Surfacing Materials**: The number of samples and sample locations were determined according to the EPA guidance publication, *Simplified Sampling Scheme for Friable Surfacing Materials* (EPA 560/5-85-030a, October, 1985), a recommended number of 9 samples per HA or a minimum of 3, 5, or 7 based on the square footage of each HA.

    - **Thermal System Insulation Materials**: The number of samples and sample locations were determined according to the quantity of the material observed, and the Asbestos Hazard Evaluation Specialist's judgment on the homogeneity of the materials. A minimum of three (3) samples was collected from each type of suspect

thermal system insulation identified. Materials such as fiberglass and foam insulation are not considered suspect of containing asbestos, and, therefore, were not sampled.

- **Miscellaneous Materials**: The number of samples and sample locations were determined according to the quantity of the material observed, and the Asbestos Hazard Evaluation Specialist's judgment on the homogeneity of the material. Samples were collected "in a manner sufficient to determine whether the material is ACM or not ACM" in accordance with 40 CFR Part 763.86 (c-d).

- Bulk samples were collected directly from exposed materials. Prior to sample collection, the surface was sprayed with a surfactant to reduce potential fiber release. A complete core or cross-section sample of each material was taken to ensure that each layer of suspect ACM was representative of the parent material. The samples were carefully placed in a labeled sample container and sealed, and the information recorded onto a chain-of-custody form. In addition, sampling locations were noted and suspect materials were photographed.

Condition Assessment

A condition assessment for each confirmed asbestos-containing material/functional space is provided based upon the condition of the material as observed during the survey. The condition of each material is determined according to the following criteria:

General Damage Criteria	AHERA Damage Category	Criteria
Good	No Damage	Not damaged
Fair	Damage	Up to 10% overall damage Up to 25% localized damage
Poor	Significant Damage	Over 10% overall damage Over 25% localized damage

Sample Analysis

- All samples were initially analyzed in a laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) using Polarized Light Microscopy (PLM) and dispersion-staining techniques (EPA Method 600\R-93\116). Because the PLM method has been known to provide false positive or false negative results at low asbestos concentrations, low asbestos results cannot be guaranteed. Therefore, when low concentrations are reported, additional analysis may be conducted using the Point Count Method.

- In some cases, particularly where there is little question about the homogeneity of samples collected from a Homogeneous Area, if the first sample analyzed is positive, the remaining samples may be assumed to contain asbestos and not be analyzed.

- A Homogeneous Area is determined to contain no asbestos when all samples from the Homogeneous Area are analyzed via PLM method and found to contain no asbestos. If

all samples collected from a Homogeneous Area exhibit no asbestos content whatsoever, no additional analysis is conducted.

- If any sample from a Homogeneous Area is found to contain asbestos, the entire Homogeneous Area is assumed to contain asbestos unless additional analysis by Point Count or TEM is conducted, or additional assessment or sampling can further delineate the extent of the ACM within the Homogeneous Area.

5.0 ASBESTOS SURVEY FINDINGS

Chris Rittenhouse, Ohio Asbestos Hazard Evaluation Specialist #35305 and Kurt Boyer, Ohio Asbestos Hazard Evaluation Specialist #36361, conducted the survey on February 15, 2019 with follow up assessments on March 1, 2019 and March 20, 2019. On March 4th Chris Rittenhouse and Matt McClelland, Ohio Asbestos Hazard Evaluation Specialist #34598 conducted additional inspections. Two hundred (200) samples representing fifty-five (55) homogeneous areas were collected and submitted to Eurofins/CEI Laboratories of Cary, North Carolina, a NVLAP-certified laboratory, for analysis. The following asbestos-containing materials were identified during the assessment:

Asbestos-containing Materials

The following building materials have been confirmed to contain asbestos concentrations in excess of the EPA regulatory threshold of >1.0%:

HSA	Description	Location	Condition	EPA Classification	Est. Quantity
3, 72	Brown Ceiling Tile Mastic (Assoc. with 1'x1' Ceiling Tile)	Throughout 1952 Addition, Cafeteria Area	Good	Cat II NF	22,000 SF
7, 15, 17, 22, 23, 29, 33,	Resilient Floor Tile Various Colors & Styles	Throughout	Good	Cat I NF	40,950 SF
	Resilient Floor Tile Various Colors & Styles (Under Carpet)	1915 Addition – 2nd Floor Hall, Room 211	Good	Cat I NF	1,550 SF
*	Hard Plaster Finish and Base Coat	1915 Addition 3rd Floor Walls Ceilings, Stairwell	Good	RACM	15,000 SF
*	Pipe Insulation	Throughout – Assumed to be Hidden within Walls/Above Ceilings/Beneath Floors/ Pipe Chases	N/A	RACM	1,800 LF
*	Mud Fittings				500 Ea.
20	Transite Window Panels	1915 Addition	Good	Cat II NF	900 SF / 90 Ea.
83	White Door & Window Caulk	Doors & Windows-1956/57 Addition	Good	Cat II NF	40 SF / 40 Openings
89, 91	White/Gray Concrete Seam Caulk	Cafeteria Area on Exterior Brick	Good	Cat II NF	3 SF

RACM – Regulated Asbestos-containing material; Cat I NF – Category I nonfriable; Cat II NF – Category II nonfriable; LF – Linear-feet; SF – Square-feet; Ea – Each

*Hard Plaster Finish and Base Coat, as well as Pipe Insulation and Mud Fittings were identified as confirmed asbestos-containing in the previous reports from Tackett Environmental Services, Inc. (Appendix D).

All asbestos-containing materials that will be disturbed during the demolition should be removed and disposed of by a licensed asbestos abatement contractor in accordance with the Asbestos NESHAPS, 40 CFR Part 61, and the OSHA Asbestos in Construction Standard, 29 CFR 1926.1101.

Assumed Asbestos-containing Materials

The following suspect materials, identified via field observations or review of the original construction drawings, were either inaccessible for sampling or would have required destructive sampling techniques, and, therefore, were not sampled.

These materials should be assumed to contain asbestos and removed by a licensed asbestos abatement contractor if they will be disturbed during demolitions unless they are first sampled by a licensed Asbestos Hazard Evaluation Specialist and determined not to be ACMs by laboratory analysis.

Description	Location	Condition	EPA Classification	Total Est. Quantity
Roofing Tars and Flashings	Roof Area	Good	Cat I NF	36,500 SF
Board mastic	Throughout	Good	Cat II NF	5,000 SF
Fire doors/ Solid Core Doors	Throughout	Good	Cat II NF	54 EA
Boiler Internal Components / Gaskets	Boiler Room	N/A	RACM	2 Units
Vibration Dampener	Music Storage Room, Kitchen	Good	Cat II NF	24 SF

RACM – Regulated Asbestos-containing material; Cat I NF – Category I nonfriable; Cat II NF – Category II nonfriable; LF – Linear-feet; SF – Square-feet; EA – Each

Materials with Asbestos Concentrations of 1% or Less

The following materials were reported to contain asbestos in concentrations less than the EPA regulatory threshold of >1%:

HSA	Sample Nos.	Description	Location	Condition	Est. Quantity
18, 35	18 A-E, 35 A-G	Hard Plaster	1915 Addition	Good	30,000 SF
19	19 A-E	Ceiling Texture II	1915 Addition – Art Storage	Good	400 SF

HSA – Homogeneous Sample Area; SF – Square-feet

Materials with concentrations of asbestos equal to or less than 1% do not meet the definition of an asbestos-containing material per the Asbestos NESHAPS, and are not regulated by the EPA.

However, portions of the OSHA Asbestos in Construction Standard, 29 CFR 1926.1101, still apply to the management of these materials.

6.0 OTHER HAZARDOUS MATERIALS

The subject building was visually surveyed in order to identify equipment and materials with the potential to contain lead, PCBs, materials falling under the Universal Waste classification of the Ohio EPA, (i.e., discarded batteries, universal waste lamps, pesticides, and mercury-containing equipment), and other potentially hazardous materials that will require removal prior to building demolition.

Lead-based Paint - Based on the age of construction, it is assumed that lead-based paint is present. All contractors involved in the demolition project should be notified of the likely presence of lead-based coatings in accordance with the OSHA Lead in Construction Standard, 29 CFR 1926.62. All aspects of the OSHA Lead in Construction Standard will apply during any activities that may disturb painted/coated building components.

Universal Waste Lamps: Universal waste lamps, primarily fluorescent tubes, are present throughout the building (Estimated 1,800). All universal waste lamps should be removed prior to demolition and recycled in accordance with the Ohio EPA's rules governing the disposal of Universal Wastes (OAC 3745-273).

PCB-containing Equipment: Oils associated with fluorescent light ballasts located throughout the subject building may contain Polychlorinated Biphenyls **(**PCBs) (Estimated 600). All light ballasts that will be removed during the project should be inspected for labels indicating their PCB content, or a date stamp indicating the year of their manufacture. Ballasts without a "Non-PCB" label or with a date stamp of 1980 or prior should be assumed to contain PCBs. Non PCB-containing light ballasts may be recycled or disposed of at a solid waste landfill. Intact PCB-containing ballasts may be disposed of at a solid waste landfill. Any leaking PCB-containing ballasts must be disposed of in an approved incinerator or landfill in accordance with the Toxic Substance Control Act (TSCA, 40 CFR Part 761).

Mercury-containing Equipment: Mercury-containing ampoules were observed in Boiler Room gauges (Estimated 3 gauges). No evidence of spilled mercury was observed. The mercury-containing ampoules and any other mercury-containment equipment that will be removed during demolition should be handled in accordance with the Ohio EPA's rules governing the disposal of Universal Wastes (OAC 3745-273).

Refrigerant-containing Equipment – Refrigerant-containing equipment including, but not limited to, water coolers, air conditioning units, HVAC units, refrigerators and freezers are present in the building. If these items will not be re-used, they should be removed prior to demolition and the refrigerants should be evacuated in accordance with all applicable EPA regulations on refrigerant handling, recycling, and recovery with certified personnel and equipment.

Miscellaneous Chemicals – Cleaning products, maintenance products and other miscellaneous chemicals are present in the building. If these materials are not to be re-used, they should be

characterized and disposed of in accordance with applicable hazardous waste disposal regulations (40 CFR Part 261).

7.0 LIMITATIONS and EXCEPTIONS

7.1 CTL Engineering has prepared this report for your use, in accordance with generally accepted practices and industry and professional standards applicable to similar work. The information obtained in this report is site-specific and pertains to this project only.

7.2 Because the facility was still in use at the time of the assessment, no destructive sampling was performed. It is likely that ACMs are present within concealed areas, such as above hard ceilings, within walls and beneath floors. These areas should be investigated by the abatement contractor prior to demolition of the building. In the event that any previously unidentified suspect ACMs are encountered, those materials should be sampled and assessed by a licensed Asbestos Hazard Evaluation Specialist or assumed to contain asbestos and treated accordingly. Should any additional ACMs be discovered, only properly trained and licensed personnel should perform work activities that may disturb these materials.

7.3 The conclusions provided in this report are based on data collected from individual bulk sampling locations. Conditions between bulk sample locations may vary, and it should not be expected that these will be precisely represented by any one bulk sample.

7.4 Although this report was prepared for the exclusive use of the **LWC Inc.**(Client) and **Wayne Local School District**, it may be relied upon by any lending institution, third party, or entity expressly designated by the Client, provided that CTL Engineering is also informed, in writing, and that the use of the report is subject to the limitations and exceptions set forth in this report, as well as the terms and conditions contained in the original contract documents signed by CTL Engineering and the Client. However, CTL Engineering will not distribute or publish this proprietary report to any third party without the Client's written consent, except as required by law or a court order.

7.5 Suspect ACM samples will be retained by the laboratory for a period of thirty (30) days from the date of analysis after which they will be discarded, unless otherwise instructed by the Client. This asbestos survey covered the building materials of the referenced structure, with the exception of the inaccessible portions as previously noted. The liability of CTL Engineering, with regard to professional error and omissions, cannot be in excess of the fee charged for this project.

7.6 This report, including the estimated quantities provided herein, is not intended for use in lieu of Hazardous Material Abatement Design Specifications for the solicitation of abatement bids. Abatement contractors shall visit the site and prepare their own estimates of quantities prior to submitting abatement bids.

7.7 The opinions expressed in this report are based on CTL Engineering's experience, previous reports' review, and other available information. This survey evaluated the conditions that existed at the time of survey and does not warrant against future alteration of conditions at the subject site, or subsequent changes in environmental regulations.

We appreciate the opportunity to provide you with these professional services. If you should have any questions, or need further information, please feel free to contact our office. Please refer to CTL Engineering Project No. 18510214COLa in all correspondence and inquiries.

Respectfully submitted,

CTL ENGINEERING of OHIO, INC.

Chris Rittenhouse
Ohio Asbestos Hazard Evaluation
Specialist No. 35305

Kurt Boyer
Ohio Asbestos Hazard Evaluation
Specialist No. 36361

Brad Keller
Ohio Asbestos Hazard Evaluation
Specialist No. 34621
(Technical Review)

Matt McClelland
Ohio Asbestos Hazard Evaluation
Specialist No. 34598

APPENDIX A

Site Photographs

Photo 1 – View of Homogeneous Area (HA) 1 – 2'x'4 Ceiling Tile Large/Small Pinhole.

Photo 2 – View of Homogeneous Area 2 – 12" White with Gray Speckles Floor Tile with Black Mastic.

Photo 3 – View of Homogeneous Area 3 – 1'x1' Ceiling Tile with Asbestos-Containing Brown Mastic.

Photo 4 – View of Homogeneous Area 4 – Skim Coat.

Photo 5 – View of Homogeneous Area 5 – Hard Plaster.

Photo 6 – View of Homogeneous Area 6 – 2'x4' Ceiling Tile Gypsum.

Photo 7 – View of Homogeneous Area 7 – Asbestos-Containing 9" Tan/Brown Floor Tile.

Photo 8 – View of Homogeneous Area 8 – 9" Light/Dark Gray Floor Tile.

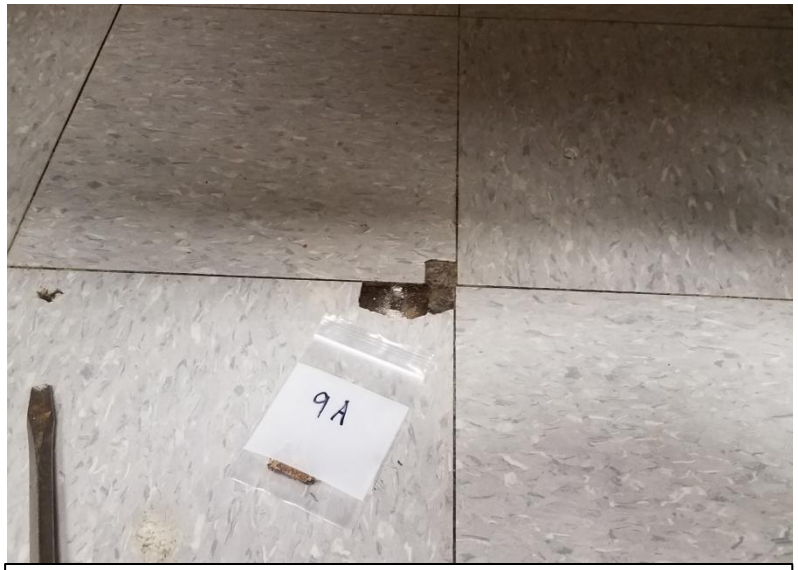


Photo 9 – View of Homogeneous Area 9 – 12” Light Blue Floor Tile.

Photo 10 – View of Homogeneous Area 10 – Hard Plaster II.

Photo 11 – View of Homogeneous Area 11 – 2’x4’ Ceiling Tile Birdtrack.

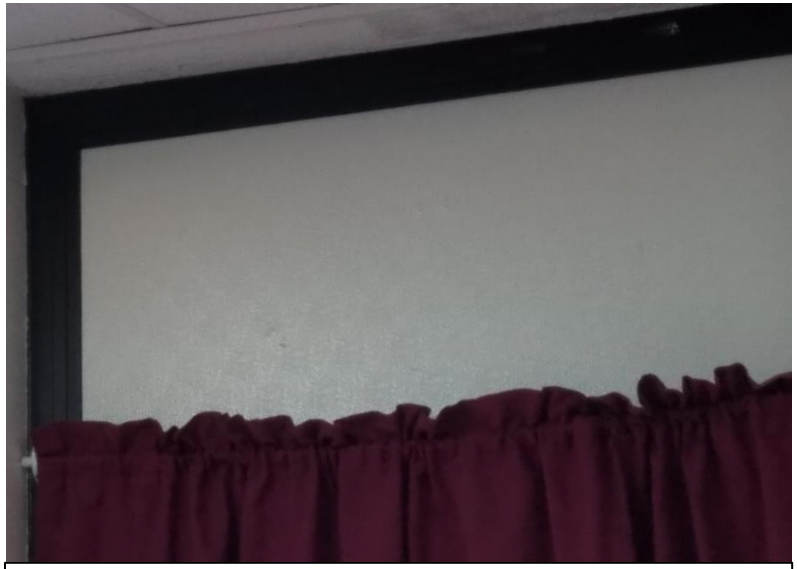


Photo 12 – View of Homogeneous Area 12 – Gypsum Window Panels.

Photo 13 – View of Homogeneous Area 13 – Light Weight Concrete.

Photo 14 – View of Homogeneous Area 14 – Light Weight Concrete II.

Photo 15 – View of Homogeneous Area 15 – Asbestos-Containing 9" Off-White Floor Tile.

Photo 16 – View of Homogeneous Area 16 – Hard Plaster III.

Photo 17 – View of Homogeneous Area 17 – Asbestos-Containing 9" Maroon / Beige Floor Tile.

Photo 18 – View of Homogeneous Area 18 – <1% Asbestos Hard Plaster Ceiling.

Photo 19 – View of Homogeneous Area 19 – <1% Asbestos Ceiling Texture II.

Photo 20 – View of Homogeneous Area 20 – Asbestos-Containing Transite Window Panel - 1918.

Photo 21 – View of Homogeneous Area 21 – Black Covebase 1918.

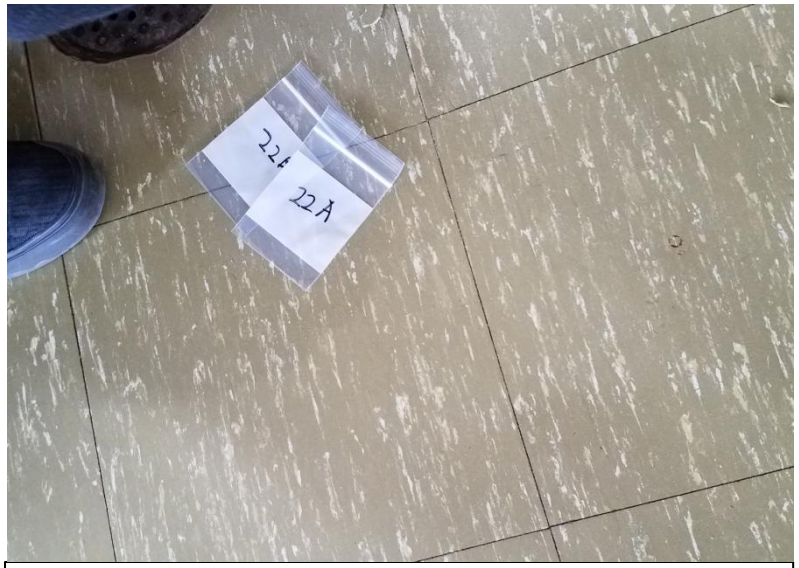


Photo 22 – View of Homogeneous Area 22 – Asbestos-Containing 12" Green Floor Tile.

Photo 23 – View of Homogeneous Area 23 – Asbestos-Containing 9" Maroon / Beige Floor Tile.

Photo 24 – View of Homogeneous Area 24 – Plaster Board.

Photo 25 – View of Homogeneous Area 25 – 2'x4' Ceiling Tile Pinhole 1918.

Photo 26 – View of Homogeneous Area 26 – Red Stair Tread.

Photo 27 – View of Homogeneous Area 27 – Yellow Carpet Mastic.

Photo 28 – View of Homogeneous Area 28 – Tan Vinyl Sheet Flooring.

Photo 29 – View of Homogeneous Area 29 – Asbestos-Containing Beige Sheet Flooring with Asbestos-Containing Brown Mastic.

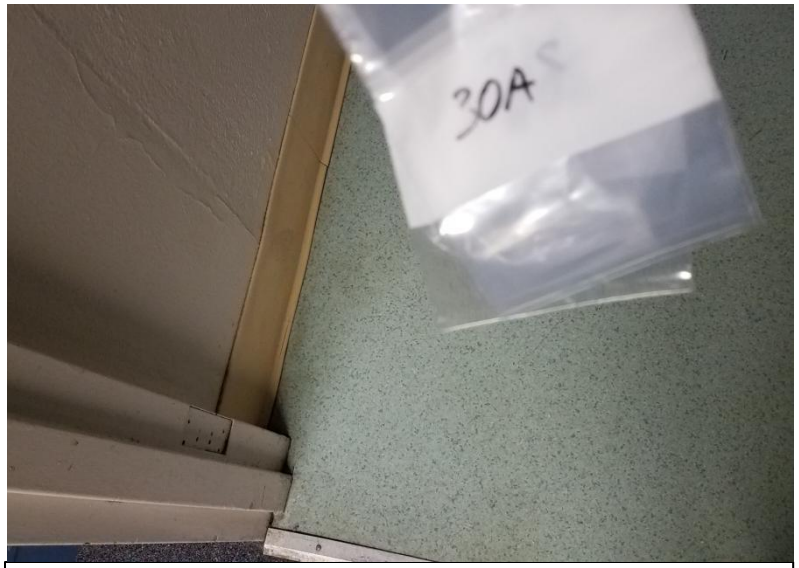


Photo 30 – View of Homogeneous Area 30 - Light Green Sheet Flooring.

Photo 31 – View of Homogeneous Area 31 – Creme Cove Base Mastic.

Photo 32 – View of Homogeneous Area 32 – Yellow Carpet Mastic II.

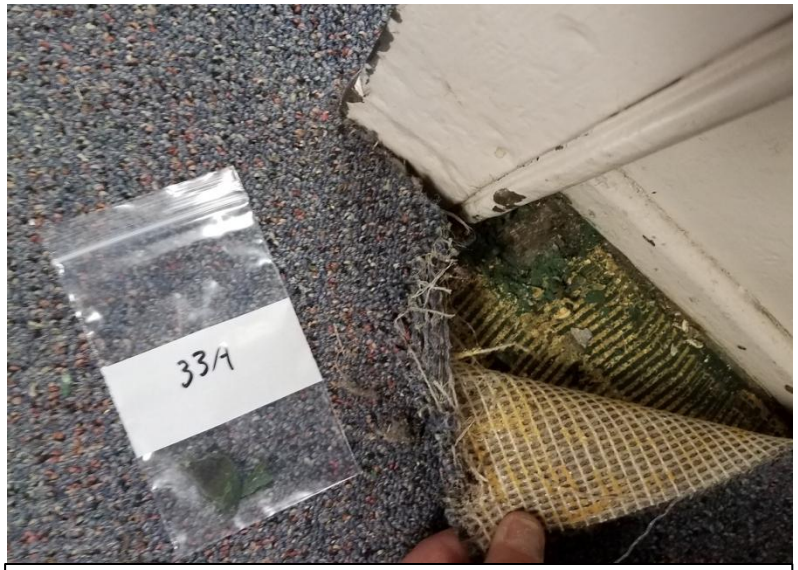


Photo 33 – View of Homogeneous Area 33 – Asbestos-Containing 9" Green Floor Tile & Asbestos-Containing Black Mastic (Under Carpet).

Photo 34 – View of Homogeneous Area 34 – Beige Pattern Sheet Flooring.

Photo 35 – View of Homogeneous Area 35 – <1% Asbestos Hard Plaster Walls - 1918.

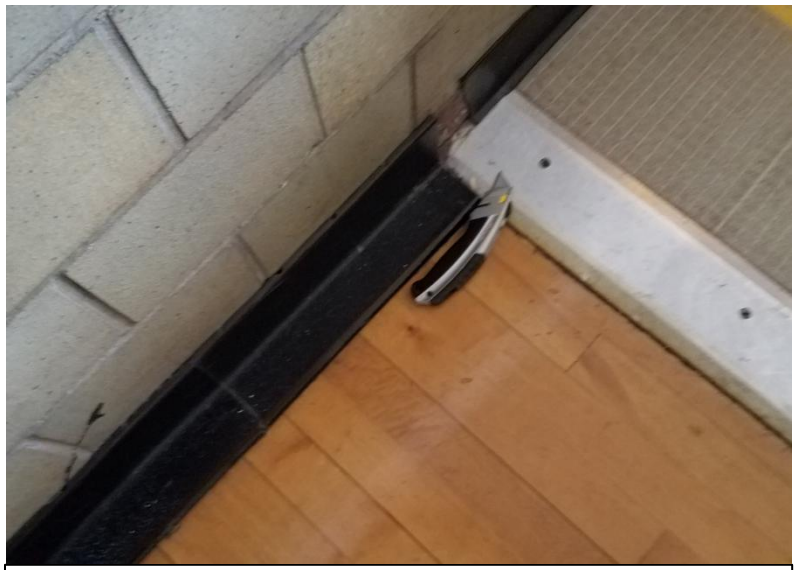


Photo 36 – View of Homogeneous Area 36 – Black Cove Base Gym.

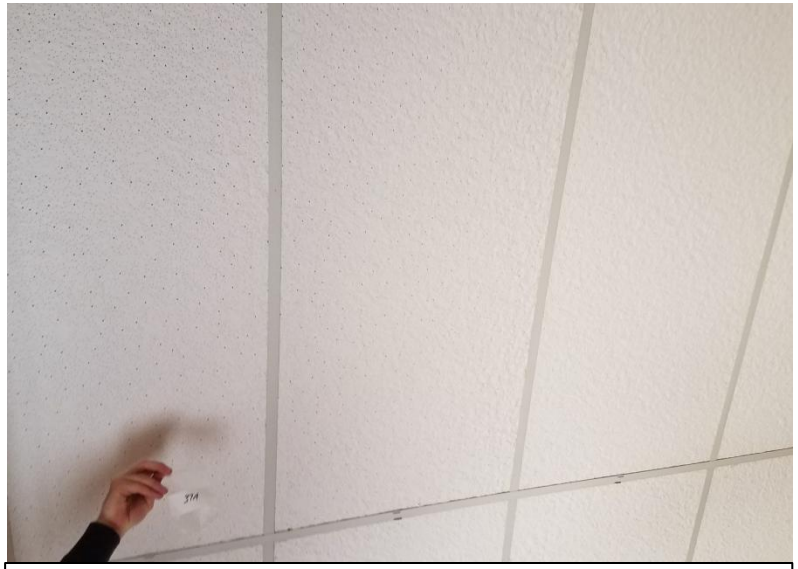


Photo 37 – View of Homogeneous Area 37 – 2'x4' Ceiling Tile Bumpy.

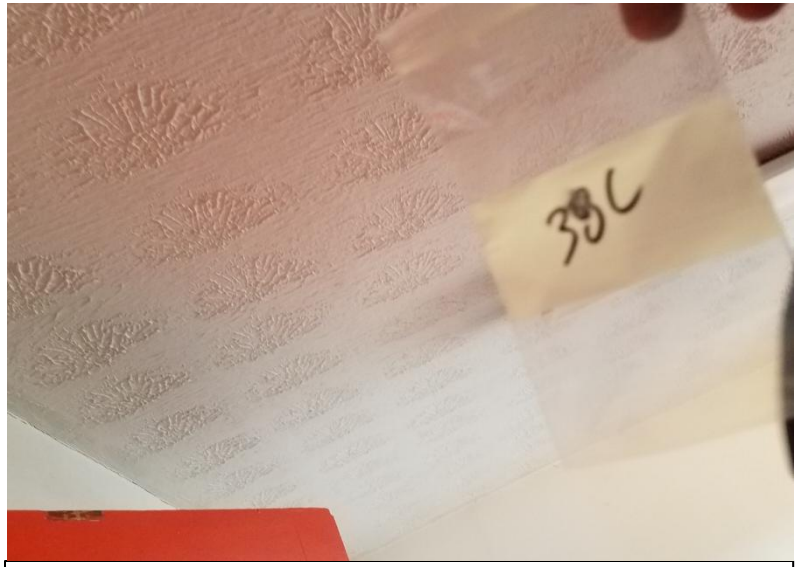


Photo 38 – View of Homogeneous Area 38 – Ceiling Texture Sponge.

Photo 39 – View of Homogeneous Area 39 – 12" White Triangle Floor Tile.

Photo 40 – View of Homogeneous Area 40 – 12" Tan Square Floor Tile.

Photo 41 – View of Homogeneous Area 41 – Brown Ceiling Mastic Gym.

Photo 42 – View of Homogeneous Area 42 – 2'x4' Ceiling Tile – Speckled.

Photo 43 – 12" White with Gray Specks Floor Tile.

Photo 44 – View of Homogeneous Area 44 – Gypsum Window Panels II.

Photo 45 – View of Homogeneous Area 45 – 12” Light / Dark Gray Floor Tile.

Photo 46 – View of Homogeneous Area 46 – Blue Covebase with Tan Mastic 1952.

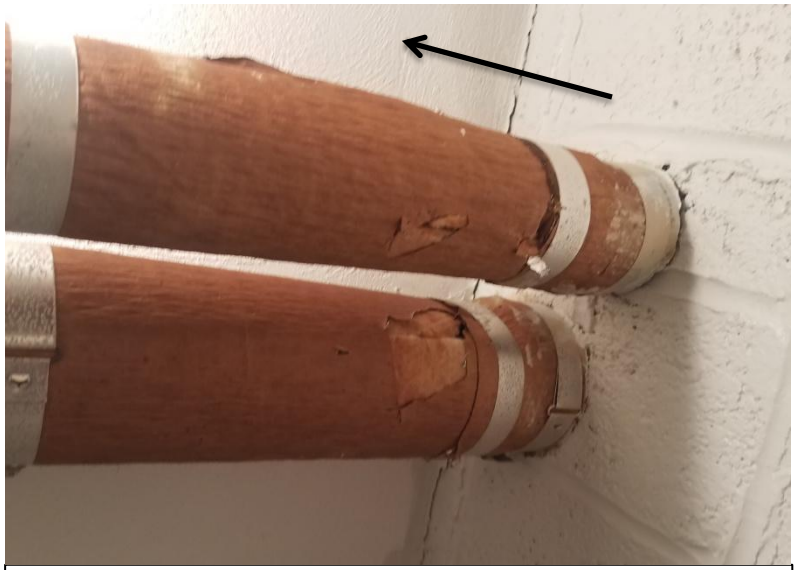


Photo 47 – View of Homogeneous Area 47 – Hard Plaster 1952.

Photo 48 – View of Homogeneous Area 48 – Light Weight Concrete Deck III - 1952.

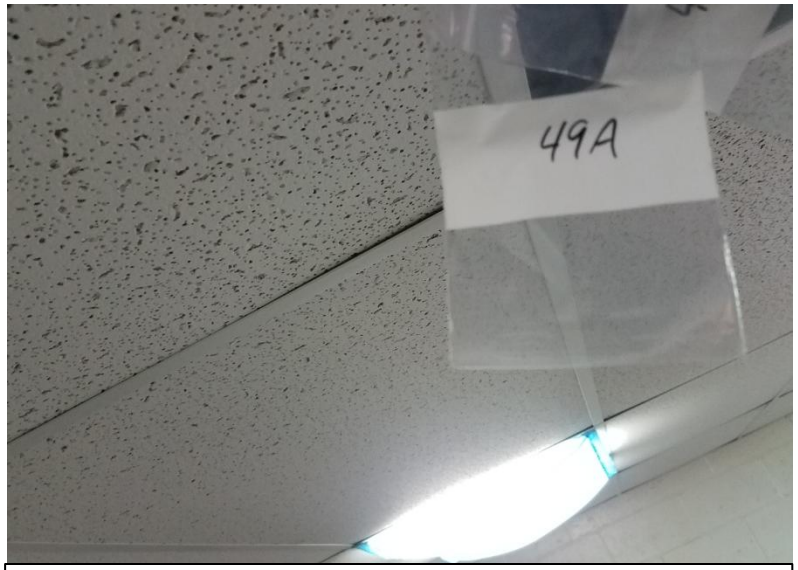


Photo 49 – View of Homogeneous Area 49 – 2'x4' Ceiling Tile Speckled II - 1952.

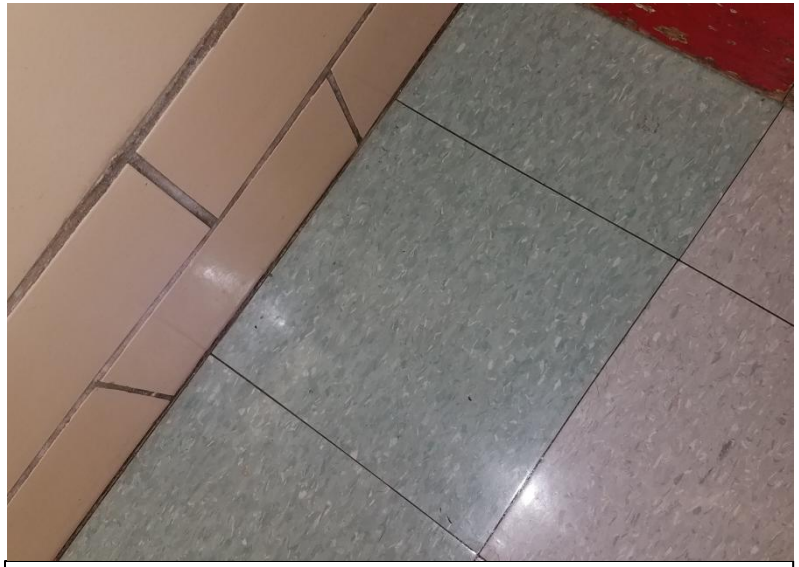


Photo 50 – View of Homogeneous Area 50 – 12" Floor Tile Green Mottled - 1952.

Photo 51 – View of Homogeneous Area 51 – Black Tar on Brown Paper Insulation.

Photo 52 – View of Homogeneous Area 52 – Gypsum Window Panel III - 1952.

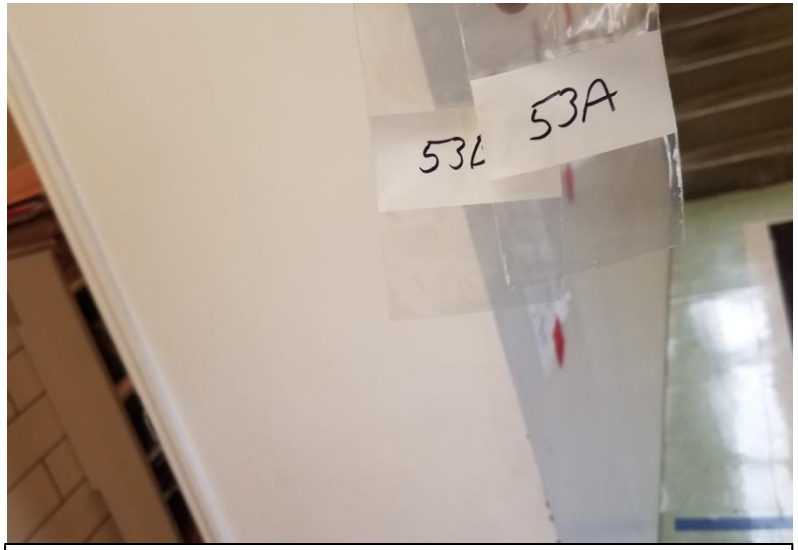


Photo 53 – View of Homogeneous Area 53 – Drywall / Joint Compound.

Photo 54 – View of Homogeneous Area 54 – Gray Stair Tread / Mastic.

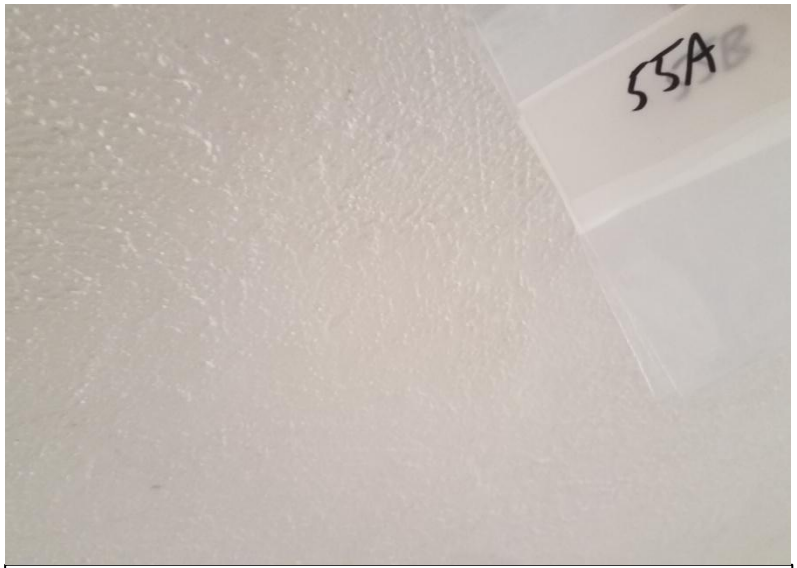


Photo 55 – View of Homogeneous Area 55 – Ceiling Plaster II – 1952.

Photo 56 – View of Homogeneous Area 56 – Drywall Central Office

Photo 57 – View of Homogeneous Area 57 – Ceiling Texture Central Office.

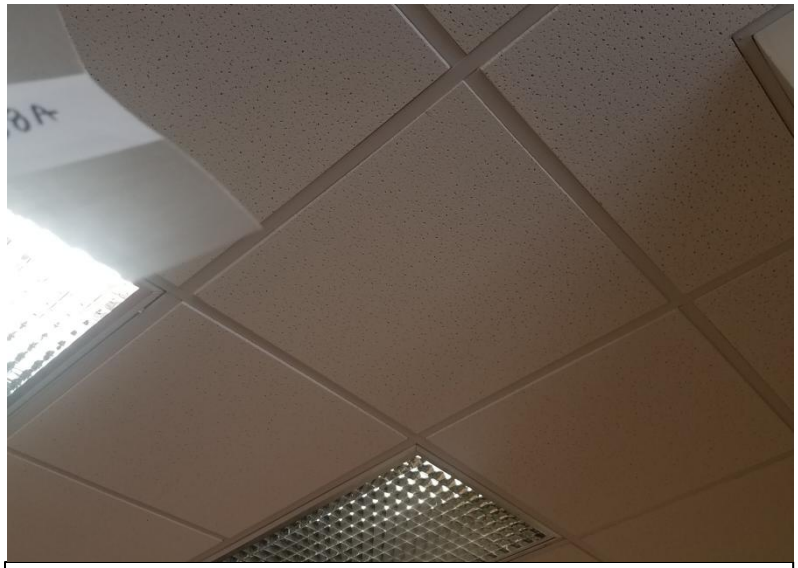


Photo 58 – View of Homogeneous Area 58 – Ceiling Tile Pinhole Central Office.

Photo 59 – View of Homogeneous Area 59 – Ceiling Tile Wormhole Central Office.

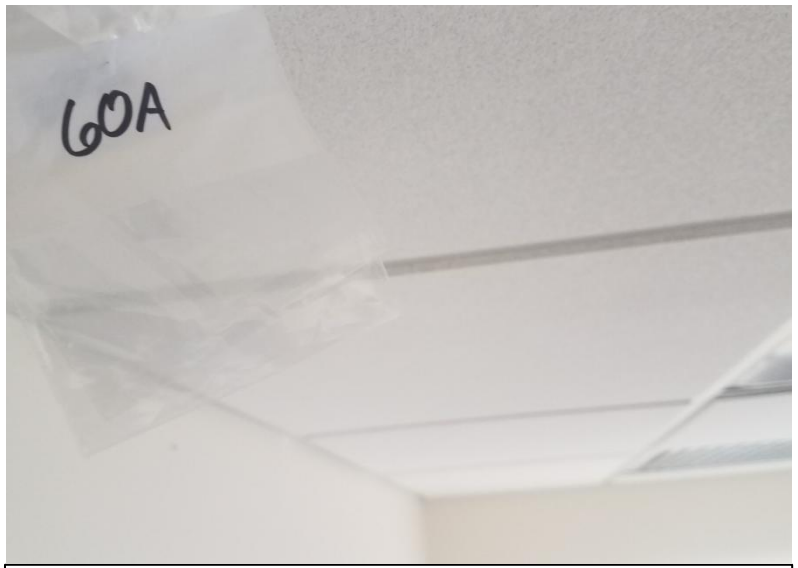


Photo 60 – View of Homogeneous Area 60 – Ceiling Tile Smooth Central Office.

Photo 61 – View of Homogeneous Area 61 – 12” White With Blue Streaks Floor Tile With Tan Mastic.

Photo 62 – View of Homogeneous Area 62 – Faux Wood Vinyl Sheet Flooring With Tan Mastic.

Photo 63 – View of Homogeneous Area 63 – Drywall/ Joint Compound II.

Photo 64 – View of Homogeneous Area 64 – Tan Carpet Mastic Central Office.

Photo 65 – View of Homogeneous Area 65 – Tan Stucco Central Office.

Photo 66 – View of Homogeneous Area 66 – Off-White Door Caulk Central Office (Close view not available).

Photo 67 – View of Homogeneous Area 67 – Grey Hard Plaster Ceiling.

Photo 68 – View of Homogeneous Area 68 – Drywall / Joint Compound- Central Office.

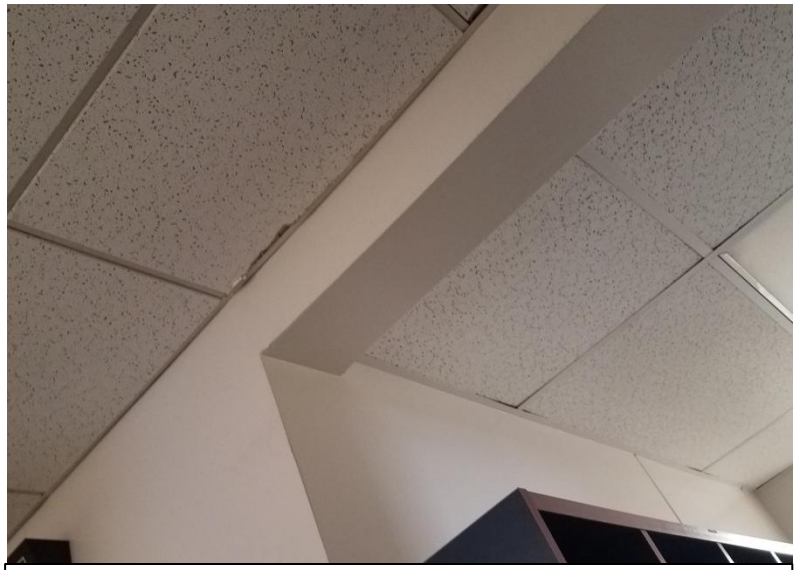


Photo 69 – View of Homogeneous Area 69 – 2'x2' Ceiling Tile Bird Track.

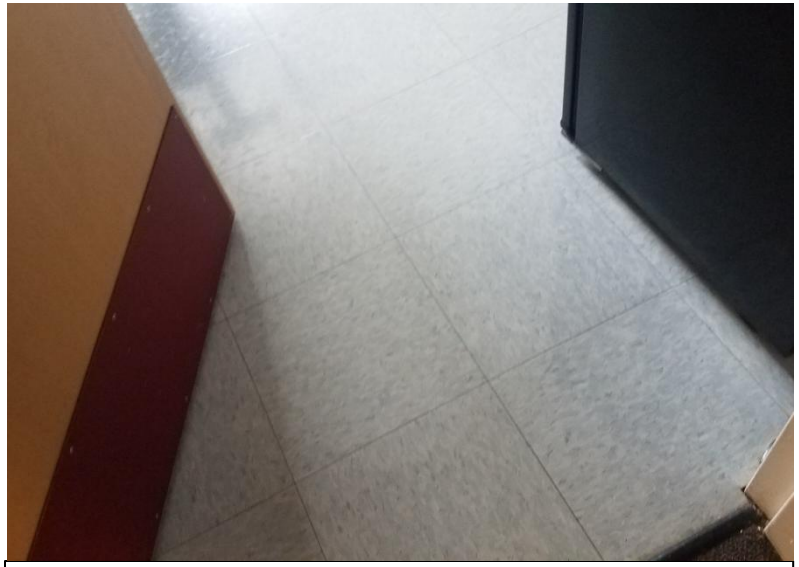


Photo 70 – View of Homogeneous Area 70 – 12" Light Blue Floor Tile With Tan Mastic.

Photo 71 – View of Homogeneous Area 71 – Black Sink Undercoating.

Photo 72 – View of Homogeneous Area 72 – 1'x1' Ceiling Tile with Asbestos-Containing Brown Mastic - 1952.

Photo 73 – View of Homogeneous Area 73 – Tan & Brown Window Caulk.

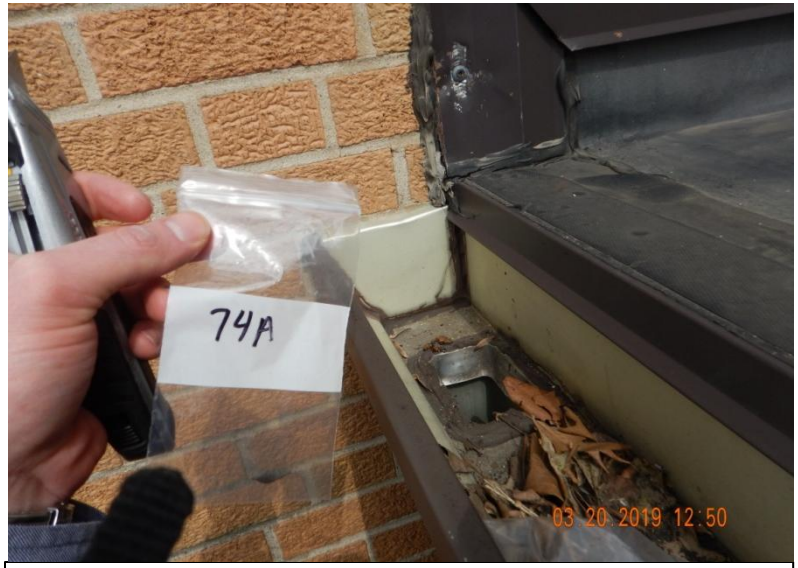


Photo 74 – View of Homogeneous Area 74 – Dark Brown & Light Brown Caulk.

Photo 75 – View of Homogeneous Area 75 – Light & Dark Grey Concrete Caulk.

Photo 76 – View of Homogeneous Area 76 – Grey & Black Window Caulk.

Photo 77 – View of Homogeneous Area 77 - Light Grey Patching Concrete Caulk.

Photo 78 – View of Homogeneous Area 78 – Tan Caulk Exterior Cafeteria.

Photo 79 – View of Homogeneous Area 79 – Grey Concrete Seam Caulk II.

Photo 80 – View of Homogeneous Area 80 – Tan/Grey Window Caulk.

Photo 81 – View of Homogeneous Area 81 – Beige Window Caulk.

Photo 82 – View of Homogeneous Area 82 – Black Caulk.

Photo 83 – View of Homogeneous Area 83 – Asbestos-Containing White Door Caulk.

Photo 84 – View of Homogeneous Area 84 – Black Window Caulk.

Photo 85 – View of Homogeneous Area 85 – Tan Window Caulk.

Photo 86 – View of Homogeneous Area 86 – Beige Concrete Caulk.

Photo 87 – View of Homogeneous Area 87 – White Window Caulk on the Preschool.

Photo 88 – View of Homogeneous Area 88 –White Door Caulk.

Photo 89 – View of Homogeneous Area 89 – Asbestos-Containing Gray Concrete Seam Caulk .

Photo 90 – View of Homogeneous Area 90 – Dark Brown Window Caulk.

Photo 91 – View of Homogeneous Area 91 – Asbestos-Containing White Concrete Seam Caulk.

Photo 92 – View of Homogeneous Area 92 – Tan Door Caulk.

Photo 93 – View of Homogeneous Area 93 – Black Window Caulk.

Photo 94 – View of Homogeneous Area 94 – Red Window Caulk.

APPENDIX B

Bulk Asbestos Sample Summary

Bulk Asbestos Sample Summary

Waynenesville Elementary

659 Dayton Road, Waynesville, OH; 45068

HOMOGENEOUS AREA	SAMPLE NO.	DESCRIPTION	ASBESTOS %	PHOTO NO.
1	1A	2'x4' Ceiling Tile Large/Small Pinhole	None Detected	1
	1B	2'x4' Ceiling Tile Large/Small Pinhole	None Detected	
2	2A	12" White with Gray Specks Floor Tile	None Detected	2
	2A	Black/Yellow Mastic	None Detected	
	2B	12" White with Gray Specks Floor Tile	None Detected	
	2B	Black/Yellow Mastic	None Detected	
	2C	12" White with Gray Specks Floor Tile	None Detected	
	2C	Black/Yellow Mastic	None Detected	
	2D	12" White with Gray Specks Floor Tile	None Detected	
	2D	Black/Yellow Mastic	None Detected	
3	3A	1'x1' Ceiling Tile	None Detected	3
	3A	**Brown Mastic**	**3% Chrysotile**	
	3B	Sample Not Analyzed	Not Analyzed	
4	4A	Skim Coat	None Detected	4
	4B	Skim Coat	None Detected	
	4C	Skim Coat	None Detected	
	4D	Skim Coat	None Detected	
	4E	Skim Coat	None Detected	
5	5A	Hard Plaster I - Skim Coat	None Detected	5
	5A	Hard Plaster I - Base Coat	None Detected	
	5B	Hard Plaster I - Skim Coat	None Detected	
	5B	Hard Plaster I - Base Coat	None Detected	
	5C	Hard Plaster I - Skim Coat	None Detected	
	5C	Hard Plaster I - Base Coat	None Detected	
6	6A	2'X4' Ceiling Tile - Gypsum	None Detected	6
	6B	2'X4' Ceiling Tile - Gypsum	None Detected	
7	**7A**	**9" Tan/Brown Floor Tile**	**3% Chrysotile**	7
	7A	Yellow Mastic	None Detected	
	7B	Sample Not Analyzed	Not Analyzed	
8	8A	9" Light Gray Floor Tile	None Detected	8
	8A	Yellow Mastic	None Detected	
	8A	9" Dark Gray Floor Tile	None Detected	
	8A	Brown Mastic	None Detected	
	8B	9" Light Gray Floor Tile	None Detected	
	8B	Yellow Mastic	None Detected	
	8B	9" Dark Gray Floor Tile	None Detected	
	8B	Brown Mastic	None Detected	
9	9A	12" Light Blue Floor Tile	None Detected	9
	9A	Tan Mastic	None Detected	
	9B	12" Light Blue Floor Tile	None Detected	
	9B	Tan Mastic	None Detected	
10	10A	Hard Plaster II - Skim Coat	None Detected	10
	10B	Hard Plaster II - Skim Coat	None Detected	
	10B	Hard Plaster II - Base Coat	None Detected	
	10C	Hard Plaster II - Skim Coat	None Detected	
	10C	Hard Plaster II - Base Coat	None Detected	
	10D	Hard Plaster II - Skim Coat	None Detected	

Bulk Asbestos Sample Summary

Waynenesville Elementary

659 Dayton Road, Waynesville, OH; 45068

HOMOGENEOUS AREA	SAMPLE NO.	DESCRIPTION	ASBESTOS %	PHOTO NO.
11	11A	2'X4' Ceiling Tile Birdtrack	None Detected	11
	11B	2'X4' Ceiling Tile Birdtrack	None Detected	
12	12A	Gypsum Window Panels	None Detected	12
	12B	Gypsum Window Panels	None Detected	
13	13A	Light Weight Concrete	None Detected	13
	13A	Brown Paper	None Detected	
	13B	Light Weight Concrete	None Detected	
	13B	Brown Paper	None Detected	
14	14A	Light Weight Concrete II	None Detected	14
	14B	Light Weight Concrete II	None Detected	
15	**15A**	**9" Off-White Floor Tile**	**2% Chrysotile**	15
	15A	Tan Mastic	None Detected	
	15B	Sample Not Analyzed	Not Analyzed	
16	16A	Hard Plaster III - Skim Coat	None Detected	16
	16A	Hard Plaster III - Base Coat	None Detected	
	16B	Hard Plaster III - Skim Coat	None Detected	
	16C	Hard Plaster III - Skim Coat	None Detected	
	16D	Hard Plaster III - Skim Coat	None Detected	
	16D	Hard Plaster III - Base Coat	None Detected	
	16E	Hard Plaster III - Skim Coat	None Detected	
	16E	Hard Plaster III - Base Coat	None Detected	
17	**17A**	**9" Beige Floor Tile**	**10% Chrysotile**	17
	17A	Black Mastic	None Detected	
	17A	**9" Maroon Floor Tile**	**10% Chrysotile**	
	17A	Black Mastic	None Detected	
	17B	Sample Not Analyzed	Not Analyzed	
18	18A	Hard Plaster Ceiling	<1% Chrysotile	18
	18B	Hard Plaster Ceiling	<1% Chrysotile	
	18C	Hard Plaster Ceiling	<1% Chrysotile	
	18D	Hard Plaster Ceiling	<1% Chrysotile	
	18E	Hard Plaster Ceiling	<1% Chrysotile	
	18F	Hard Plaster Ceiling	None Detected	
	18G	Hard Plaster Ceiling	None Detected	
19	19A	Ceiling Texture II	<1% Chrysotile	19
	19B	Ceiling Texture II	<1% Chrysotile	
	19C	Ceiling Texture II	<1% Chrysotile	
	19D	Ceiling Texture II	<1% Chrysotile	
	19E	Ceiling Texture II	<1% Chrysotile	
20	**20A**	**Transite Window Panel - 1918**	**15% Chrysotile**	20
	20B	Sample Not Analyzed	Not Analyzed	
21	21A	Black Covebase - 1918	None Detected	21
	21B	Black Covebase - 1918	None Detected	
22	**22A**	**12" Green Floor Tile**	**5% Chrysotile**	22
	22A	Yellow Mastic	None Detected	
	22B	Sample Not Analyzed	Not Analyzed	

Bulk Asbestos Sample Summary

Waynenesville Elementary

659 Dayton Road, Waynesville, OH; 45068

HOMOGENEOUS AREA	SAMPLE NO.	DESCRIPTION	ASBESTOS %	PHOTO NO.
23	**23A**	**9" Beige Floor Tile**	**10% Chrysotile**	23
	23A	Black Mastic	None Detected	
	23A	**9" Maroon Floor Tile**	**10% Chrysotile**	
	23A	Black Mastic	None Detected	
	23B	Sample Not Analyzed	Not Analyzed	
24	24A	Blue,White Plasterboard Skim Coat	None Detected	24
	24A	Plasterboard Base Coat	None Detected	
	24B	Blue, White Plasterboard Skim Coat	None Detected	
	24B	Plasterboard Base Coat	None Detected	
25	25A	2'x4' Ceiling Tile Pinhole	None Detected	25
	25B	2'x4' Ceiling Tile Pinhole	None Detected	
26	26A	Red Stair Tread	None Detected	26
	26A	Yellow Mastic	None Detected	
	26B	Red Stair Tread	None Detected	
	26B	Yellow Mastic	None Detected	
27	27A	Yellow Carpet Mastic	None Detected	27
	27B	Yellow Carpet Mastic	None Detected	
28	28A	Tan Vinyl Sheet Flooring	None Detected	28
	28A	Yellow Mastic	None Detected	
	28B	Tan Vinyl Sheet Flooring	None Detected	
	28B	Yellow Mastic	None Detected	
29	**29A**	**Beige Square Sheet Flooring**	**25% Chrysotile**	29
	29A	**Brown Mastic**	**3% Chrysotile**	
	29B	Sample Not Analyzed	Not Analyzed	
30	30A	Light Green Sheet Flooring	None Detected	30
	30A	Yellow Mastic	None Detected	
	30B	Light Green Sheet Flooring	None Detected	
	30B	Yellow Mastic	None Detected	
31	31A	Cream Covebase	None Detected	31
	31A	Yellow Mastic	None Detected	
	31B	Cream Covebase	None Detected	
	31B	Yellow Mastic	None Detected	
32	32A	Yellow Carpet Mastic II	None Detected	32
	32B	Yellow Carpet Mastic II	None Detected	
33	**33A**	**9" Green Floor Tile (Under Carpet)**	**10% Chrysotile**	33
	33A	**Black Mastic**	**5% Chrysotile**	
	33B	Sample Not Analyzed	Not Analyzed	
34	34A	Beige Pattern Sheet Flooring	None Detected	34
	34A	Yellow Mastic	None Detected	
	34B	Beige Pattern Sheet Flooring	None Detected	
	34B	Yellow Mastic	None Detected	
35	35A	Hard Plaster IV - 1918	<1% Chrysotile	35
	35B	Hard Plaster IV - 1918	<1% Chrysotile	
	35C	Hard Plaster IV - 1918	None Detected	
	35D	Hard Plaster IV - 1918	<1% Chrysotile	
	35E	Hard Plaster IV - 1918	None Detected	
	35F	Hard Plaster IV - 1918	None Detected	
	35G	Hard Plaster IV - 1918	None Detected	
36	36A	Black Covebase II - Gym	None Detected	36
	36A	Yellow Mastic	None Detected	
	36B	Black Covebase II - Gym	None Detected	
	36B	Yellow Mastic	None Detected	
37	37A	2'x4' Ceiling Tile Bumpy	None Detected	37
	37B	2'x4' Ceiling Tile Bumpy	None Detected	
38	38A	Ceiling Texture - Sponge	None Detected	38
	38B	Ceiling Texture - Sponge	None Detected	
	38C	Ceiling Texture - Sponge	None Detected	

Bulk Asbestos Sample Summary

Waynenesville Elementary

659 Dayton Road, Waynesville, OH; 45068

HOMOGENEOUS AREA	SAMPLE NO.	DESCRIPTION	ASBESTOS %	PHOTO NO.
39	39A	12" White Triangle Floor Tile	None Detected	39
	39A	Clear Mastic	None Detected	
	39B	12" White Triangle Floor Tile	None Detected	
	39B	Clear Mastic	None Detected	
40	40A	12" Tan Square Floor Tile	None Detected	40
	40A	Clear Mastic	None Detected	
	40B	12" Tan Square Floor Tile	None Detected	
	40B	Clear Mastic	None Detected	
41	41A	Brown Ceiling Mastic Gym	None Detected	41
	41B	Brown Ceiling Mastic Gym	None Detected	
42	42A	2'x4' Ceiling Tile - Speckled	None Detected	42
	42B	2'x4' Ceiling Tile - Speckled	None Detected	
43	43A	12" White with Gray Specks Floor Tile II	None Detected	43
	43A	Yellow Mastic	None Detected	
	43B	12" White with Gray Specks Floor Tile II	None Detected	
	43B	Yellow Mastic	None Detected	
	43C	White Floor Tile	None Detected	
	43C	Tan Mastic	None Detected	
	43C	Gray Leveling Compound	None Detected	
	43C	Black Mastic	None Detected	
	43D	White Floor Tile	None Detected	
	43D	Black Mastic	None Detected	
44	44A	Gypsum Window Panels II	None Detected	44
	44B	Gypsum Window Panels II	None Detected	
45	45A	12" Light Gray Floor Tile	None Detected	45
	45A	Black Mastic	None Detected	
	45A	12" Dark Gray Floor Tile	None Detected	
	45A	Yellow Mastic	None Detected	
	45B	12" Light Gray Floor Tile	None Detected	
	45B	Black Mastic	None Detected	
	45B	12" Dark Gray Floor Tile	None Detected	
	45B	Yellow Mastic	None Detected	
	45C	12" Light Gray Floor Tile	None Detected	
	45C	Black Mastic	None Detected	
46	46A	Blue Covebase	None Detected	46
	46A	Tan Mastic	None Detected	
	46B	Blue Covebase	None Detected	
	46B	Tan Mastic	None Detected	
47	47A	Hard Plaster	None Detected	47
	47B	Hard Plaster	None Detected	
	47C	Hard Plaster	None Detected	
	47D	Hard Plaster	None Detected	
	47E	Hard Plaster	None Detected	
48	48A	Light Weight Concrete Deck III	None Detected	48
	48A	Brown Paper	None Detected	
	48B	Light Weight Concrete Deck III	None Detected	
	48B	Brown Paper	None Detected	
49	49A	2'x4' Ceiling Tile - Speckled II	None Detected	49
	49B	2'x4' Ceiling Tile - Speckled II	None Detected	

Bulk Asbestos Sample Summary

Waynenesville Elementary

659 Dayton Road, Waynesville, OH; 45068

HOMOGENEOUS AREA	SAMPLE NO.	DESCRIPTION	ASBESTOS %	PHOTO NO.
50	50A	12" Floor Tile - Green Mottled	None Detected	50
	50A	Black Mastic	None Detected	
	50B	12" Floor Tile - Green Mottled	None Detected	
	50B	Black Mastic	None Detected	
51	51A	Black Tar	None Detected	51
	51A	Silver / Brown Paper Insulation	None Detected	
	51B	Black Tar	None Detected	
	51B	Silver / Brown Paper Insulation	None Detected	
	51C	Black Tar	None Detected	
	51C	Silver / Brown Paper Insulation	None Detected	
52	52A	Gypsum Window Panel III	None Detected	52
	52B	Gypsum Window Panel III	None Detected	
53	53A	Drywall	None Detected	53
	53A	White Joint Compound	None Detected	
	53B	Drywall	None Detected	
	53B	White Joint Compound	None Detected	
54	54A	Gray Stair Tread	None Detected	54
	54A	Tan Mastic	None Detected	
	54B	Gray Stair Tread	None Detected	
	54B	Tan Mastic	None Detected	
55	55A	Ceiling Plaster II	None Detected	55
	55B	Ceiling Plaster II	None Detected	
	55C	Ceiling Plaster II	None Detected	
56	56A	Drywall Central Office - Joint Compound	None Detected	56
	56A	Drywall Central Office - Gypsum	None Detected	
	56B	Drywall Central Office - Joint Compound	None Detected	
57	57A	Ceiling Texture Central Office	None Detected	57
	57B	Ceiling Texture Central Office	None Detected	
	57C	Ceiling Texture Central Office	None Detected	
58	58A	Ceiling Tile Pinhole Central Office	None Detected	58
	58B	Ceiling Tile Pinhole Central Office	None Detected	
59	59A	Ceiling Tile Wormhole Central Office	None Detected	59
	59B	Ceiling Tile Wormhole Central Office	None Detected	
60	60A	Ceiling Tile Smooth Central Office	None Detected	60
	60B	Ceiling Tile Smooth Central Office	None Detected	
61	61A	12" White with Blue Streaks Floor Tile	None Detected	61
	61A	Tan Mastic	None Detected	
	61B	12" White with Blue Streaks Floor Tile	None Detected	
	61B	Tan Mastic	None Detected	
62	62A	Faux Wood Vinyl Sheet Flooring	None Detected	62
	62A	Tan Mastic	None Detected	
	62B	Faux Wood Vinyl Sheet Flooring	None Detected	
	62B	Tan Mastic	None Detected	
63	63A	White Joint Compound	None Detected	63
	63A	Drywall	None Detected	
	63B	White Joint Compound	None Detected	
	63B	Drywall	None Detected	
64	64A	Tan Carpet Mastic Central Office	None Detected	64
	64B	Tan Carpet Mastic Central Office	None Detected	
65	65A	Tan Stucco Central Office	None Detected	65
	65B	Tan Stucco Central Office	None Detected	
66	66A	Off-White Door Caulk Central Office	None Detected	66
	66B	Off-White Door Caulk Central Office	None Detected	
67	67A	Grey Hard Plaster Ceiling	None Detected	67
	67B	Grey Hard Plaster Ceiling	None Detected	
	67C	Grey Hard Plaster Ceiling	None Detected	

Bulk Asbestos Sample Summary

Waynenesville Elementary

659 Dayton Road, Waynesville, OH; 45068

HOMOGENEOUS AREA	SAMPLE NO.	DESCRIPTION	ASBESTOS %	PHOTO NO.
68	68A	White Joint Compound 2000	None Detected	68
	68B	White Joint Compound 2000	None Detected	
	68B	Drywall 2000	None Detected	
69	69A	2'x2' Ceiling Tile Bird Track 2000	None Detected	69
	69B	2'x2' Ceiling Tile Bird Track 2000	None Detected	
70	70A	12" Light Blue Floor Tile	None Detected	70
	70A	Tan Mastic	None Detected	
	70B	12" Light Blue Floor Tile	None Detected	
	70B	Tan Mastic	None Detected	
71	71A	Black Sink Undercoating	None Detected	71
	71B	Black Sink Undercoating	None Detected	
72	72A	1'x1' Ceiling Tile 1952	None Detected	72
	72A	**Brown Mastic 1952**	**2% Chrysotile**	
	72B	1'x1' Ceiling Tile 1952	None Detected	
	72B	Brown Mastic 1952	Not Analyzed	
73	73A	Tan & Brown Window Caulk	None Detected	73
	73B	Tan & Brown Window Caulk	None Detected	
74	74A	Dark Brown & Light Brown Caulk	None Detected	74
	74B	Dark Brown & Light Brown Caulk	None Detected	
75	75A	Light & Dark Grey Concrete Caulk	None Detected	75
	75B	Light & Dark Grey Concrete Caulk	None Detected	
76	76A	Grey & Black Window Caulk	None Detected	76
	76B	Grey & Black Window Caulk	None Detected	
77	77A	Light Grey Patching Concrete Caulk	None Detected	77
	77B	Light Grey Patching Concrete Caulk	None Detected	
78	78A	Tan Caulk Exterior Cafeteria	None Detected	78
	78B	Tan Caulk Exterior Cafeteria	None Detected	
79	79A	Grey Concrete Seam Caulk II	None Detected	79
	79B	Grey Concrete Seam Caulk II	None Detected	
80	80A	Tan/Grey Window Caulk	None Detected	80
	80B	Tan/Grey Window Caulk	None Detected	
81	81A	Beige Window Caulk	None Detected	81
	81B	Beige Window Caulk	None Detected	
82	82A	Black Caulk	None Detected	82
	82B	Black Caulk	None Detected	
83	**83A**	**White Door Caulk**	**2% Chrysotile**	83
	83B	White Door Caulk	Not Analyzed	
84	84A	Black Window Caulk	None Detected	84
	84B	Black Window Caulk	None Detected	
85	85A	Tan Window Caulk	None Detected	85
	85B	Tan Window Caulk	None Detected	
86	86A	Beige Concrete Caulk	None Detected	86
	86B	Beige Concrete Caulk	None Detected	
87	87A	White Window Caulk Preschool	None Detected	87
	87B	White Window Caulk Preschool	None Detected	
88	88A	White Door Caulk	None Detected	88
	88A	Brown Door Caulk	None Detected	
	88B	White Door Caulk	None Detected	
	88B	Brown Door Caulk	None Detected	
89	**89A**	**Concrete Seam Caulk III**	**5% Chrysotile**	89
	89B	Sample Not Analyzed	Not Analyzed	
90	90A	Dark Brown Window Caulk	None Detected	90
	90B	Dark Brown Window Caulk	None Detected	
91	**91A**	**White Concrete Caulk**	**3% Chrysotile**	91
	91B	Sample Not Analyzed	Not Analyzed	
92	92A	Tan Door Caulk	None Detected	92
	92B	Tan Door Caulk	None Detected	
93	93A	Black Window Caulk	None Detected	93
	93B	Black Window Caulk	None Detected	
94	94A	Red Window Caulk	None Detected	94
	94B	Red Window Caulk	None Detected	

APPENDIX C

Laboratory Reports
Chain-of-Custody Forms

eurofins | CEI

March 4, 2019

CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

CLIENT PROJECT: Waynesville Elementary, 18510214COLa
CEI LAB CODE: B191195

Dear Customer:

Enclosed are asbestos analysis results for PLM Bulk samples received at our laboratory on February 22, 2019. The samples were analyzed for asbestos using polarizing light microscopy (PLM) per the EPA 600 Method.

Sample results containing >1% asbestos are considered asbestos-containing materials (ACMs) per EPA regulatory requirements. The detection limit for the EPA 600 Method is <1% asbestos by weight as determined by visual estimation.

Thank you for your business and we look forward to continuing good relations.

Kind Regards,

Tianbao Bai, Ph.D., CIH
Laboratory Director

NVLAP TESTING
NVLAP LAB CODE 101768-0

eurofins | CEI

ASBESTOS ANALYTICAL REPORT
By: Polarized Light Microscopy

Prepared for

CTL Engineering, Inc

CLIENT PROJECT: Waynesville Elementary, 18510214COLa

LAB CODE: B191195

TEST METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

REPORT DATE: 03/04/19

TOTAL SAMPLES ANALYZED: 128

SAMPLES >1% ASBESTOS: 13

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Waynesville Elementary, 18510214COLa **LAB CODE:** B191195

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
1A		B19652	White	Ceiling Tile	None Detected
1B		B19653	White	Ceiling Tile	None Detected
2A		B19654A	White	Floor Tile	None Detected
		B19654B	Black,Yellow	Mastic	None Detected
2B		B19655A	White	Floor Tile	None Detected
		B19655B	Black,Yellow	Mastic	None Detected
2C		B19656A	White	Floor Tile	None Detected
		B19656B	Black,Yellow	Mastic	None Detected
2D		B19657A	White	Floor Tile	None Detected
		B19657B	Black,Yellow	Mastic	None Detected
3A		B19658A	Tan	Ceiling Tile	None Detected
		B19658B	Brown	Mastic	Chrysotile 3%
3B		B19659		Sample Not Analyzed per COC	
4A		B19660	White	Skim Coat	None Detected
4B		B19661	White	Skim Coat	None Detected
4C		B19662	White	Skim Coat	None Detected
4D		B19663	White	Skim Coat	None Detected
4E		B19664	White	Skim Coat	None Detected
5A	Layer 1	B19665	White	Plaster Skim Coat	None Detected
	Layer 2	B19665	Gray	Plaster Base Coat	None Detected
5B	Layer 1	B19666	White	Plaster Skim Coat	None Detected
	Layer 2	B19666	Gray	Plaster Base Coat	None Detected
5C	Layer 1	B19667	White	Plaster Skim Coat	None Detected
	Layer 2	B19667	Gray	Plaster Base Coat	None Detected
6A		B19668	White	Gypsum Ceiling Tile	None Detected
6B		B19669	White	Gypsum Ceiling Tile	None Detected
7A		B19670A	Brown,Tan	Floor Tile	Chrysotile 3%
		B19670B	Yellow	Mastic	None Detected
7B		B19671		Sample Not Analyzed per COC	
8A		B19672A	Light Gray	Floor Tile	None Detected
		B19672B	Yellow	Mastic	None Detected

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Waynesville Elementary, 18510214COLa **LAB CODE:** B191195

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
		B19672C	Dark Gray	Floor Tile	None Detected
		B19672D	Brown	Mastic	None Detected
8B		B19673A	Light Gray	Floor Tile	None Detected
		B19673B	Yellow	Mastic	None Detected
		B19673C	Dark Gray	Floor Tile	None Detected
		B19673D	Brown	Mastic	None Detected
9A		B19674A	Light Blue	Floor Tile	None Detected
		B19674B	Tan	Mastic	None Detected
9B		B19675A	Light Blue	Floor Tile	None Detected
		B19675B	Tan	Mastic	None Detected
10A		B19676	White	Plaster	None Detected
10B	Layer 1	B19677	White	Plaster Skim Coat	None Detected
	Layer 2	B19677	Gray	Plaster Base Coat	None Detected
10C	Layer 1	B19678	White	Plaster Skim Coat	None Detected
	Layer 2	B19678	Gray	Plaster Base Coat	None Detected
11A		B19679	White	Ceiling Tile	None Detected
11B		B19680	White	Ceiling Tile	None Detected
12A		B19681	White	Gypsum Window Panel	None Detected
12B		B19682	White	Gypsum Window Panel	None Detected
13A	Layer 1	B19683	Gray	Lightweight Concrete	None Detected
	Layer 2	B19683	Brown	Paper	None Detected
13B	Layer 1	B19684	Gray	Lightweight Concrete	None Detected
	Layer 2	B19684	Brown	Paper	None Detected
14A		B19685	Gray	Lightweight Concrete	None Detected
14B		B19686	Gray	Lightweight Concrete	None Detected
15A		B19687A	Off-white	Floor Tile	Chrysotile 2%
		B19687B	Tan	Mastic	None Detected
15B		B19688		Sample Not Analyzed per COC	
16A	Layer 1	B19689	Cream	Plaster Skim Coat	None Detected
	Layer 2	B19689	Gray	Plaster Base Coat	None Detected
16B		B19690	Cream	Plaster	None Detected

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Waynesville Elementary, 18510214COLa **LAB CODE:** B191195

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
16C		B19691	Cream	Plaster	None Detected
16D	Layer 1	B19692	Cream	Plaster Skim Coat	None Detected
	Layer 2	B19692	Gray	Plaster Base Coat	None Detected
16E	Layer 1	B19693	Cream	Plaster Skim Coat	None Detected
	Layer 2	B19693	Gray	Plaster Base Coat	None Detected
17A		B19694A	Beige	Floor Tile	Chrysotile 10%
		B19694B	Black	Mastic	None Detected
		B19694C	Maroon	Floor Tile	Chrysotile 10%
		B19694D	Black	Mastic	None Detected
17B		B19695		Sample Not Analyzed per COC	
18A		B19696	White,Gray	Hard Plaster Ceiling	Chrysotile <1%
18B		B19697	White,Gray	Hard Plaster Ceiling	Chrysotile <1%
18C		B19698	White,Gray	Hard Plaster Ceiling	Chrysotile <1%
18D		B19699	White,Gray	Hard Plaster Ceiling	Chrysotile <1%
18E		B19700	White,Gray	Hard Plaster Ceiling	Chrysotile <1%
19A		B19701	Gray	Ceiling Texture (Plaster)	Chrysotile <1%
19B		B19702	Gray	Ceiling Texture (Plaster)	Chrysotile <1%
19C		B19703	Gray	Ceiling Texture (Plaster)	Chrysotile <1%
19D		B19704	Gray	Ceiling Texture (Plaster)	Chrysotile <1%
19E		B19705	Gray	Ceiling Texture (Plaster)	Chrysotile <1%
20A		B19706	White	Transite Window Panel	Chrysotile 15%
20B		B19707		Sample Not Analyzed per COC	
21A		B19708	Black	Covebase	None Detected
21B		B19709	Black	Covebase	None Detected
22A		B19710A	Green	Floor Tile	Chrysotile 5%
		B19710B	Yellow	Mastic	None Detected
22B		B19711		Sample Not Analyzed per COC	
23A		B19712A	Beige	Floor Tile	Chrysotile 10%
		B19712B	Black	Mastic	None Detected
		B19712C	Maroon	Floor Tile	Chrysotile 10%
		B19712D	Black	Mastic	None Detected

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Waynesville Elementary, 18510214COLa **LAB CODE:** B191195

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
23B		B19713		Sample Not Analyzed per COC	
24A	Layer 1	B19714	Blue,White	Plasterboard Skim Coat	None Detected
	Layer 2	B19714	Off-white	Plasterboard Base Coat	None Detected
24B	Layer 1	B19715	Blue,White	Plasterboard Skim Coat	None Detected
	Layer 2	B19715	Off-white	Plasterboard Base Coat	None Detected
25A		B19716	White	Ceiling Tile	None Detected
25B		B19717	White	Ceiling Tile	None Detected
26A		B19718A	Red	Stair Tread	None Detected
		B19718B	Yellow	Mastic	None Detected
26B		B19719A	Red	Stair Tread	None Detected
		B19719B	Yellow	Mastic	None Detected
27A		B19720	Yellow	Carpet Mastic	None Detected
27B		B19721	Yellow	Carpet Mastic	None Detected
28A		B19722A	Tan	Sheet Floor	None Detected
		B19722B	Yellow	Mastic	None Detected
28B		B19723A	Tan	Sheet Floor	None Detected
		B19723B	Yellow	Mastic	None Detected
29A		B19724A	Beige	Sheet Floor	Chrysotile 25%
		B19724B	Brown	Mastic	Chrysotile 3%
29B		B19725		Sample Not Analyzed per COC	
30A		B19726A	Light Green	Sheet Floor	None Detected
		B19726B	Yellow	Mastic	None Detected
30B		B19727A	Light Green	Sheet Floor	None Detected
		B19727B	Yellow	Mastic	None Detected
31A		B19728A	Cream	Covebase	None Detected
		B19728B	Yellow	Mastic	None Detected
31B		B19729A	Cream	Covebase	None Detected
		B19729B	Yellow	Mastic	None Detected
32A		B19730	Yellow	Carpet Mastic	None Detected
32B		B19731	Yellow	Carpet Mastic	None Detected
33A		B19732A	Green	Floor Tile	Chrysotile 10%

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Waynesville Elementary, 18510214COLa **LAB CODE:** B191195

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
		B19732B	Black	Mastic	Chrysotile 5%
33B		B19733		Sample Not Analyzed per COC	
34A		B19734A	Beige	Sheet Floor	None Detected
		B19734B	Yellow	Mastic	None Detected
34B		B19735A	Beige	Sheet Floor	None Detected
		B19735B	Yellow	Mastic	None Detected
35A		B19736	White,Gray	Hard Plaster	Chrysotile <1%
35B		B19737	White,Gray	Hard Plaster	Chrysotile <1%
35C		B19738	White	Hard Plaster	None Detected
35D		B19739	White,Gray	Hard Plaster	Chrysotile <1%
35E		B19740	White	Hard Plaster	None Detected
35F		B19741	White	Hard Plaster	None Detected
35G		B19742	White	Hard Plaster	None Detected
36A		B19743A	Black	Covebase	None Detected
		B19743B	Yellow	Mastic	None Detected
36B		B19744A	Black	Covebase	None Detected
		B19744B	Yellow	Mastic	None Detected
37A		B19745	White,Gray	Ceiling Tile	None Detected
37B		B19746	White,Gray	Ceiling Tile	None Detected
38A		B19747	White	Ceiling Texture - Sponge	None Detected
38B		B19748	White	Ceiling Texture - Sponge	None Detected
38C		B19749	White	Ceiling Texture - Sponge	None Detected
39A		B19750A	White	Floor Tile	None Detected
		B19750B	Clear	Mastic	None Detected
39B		B19751A	White	Floor Tile	None Detected
		B19751B	Clear	Mastic	None Detected
40A		B19752A	Tan	Floor Tile	None Detected
		B19752B	Clear	Mastic	None Detected
40B		B19753A	Tan	Floor Tile	None Detected
		B19753B	Clear	Mastic	None Detected
41A		B19754	Brown	Ceiling Mastic	None Detected

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Waynesville Elementary, 18510214COLa **LAB CODE:** B191195

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
41B		B19755	Brown	Ceiling Mastic	None Detected
42A		B19756	White	Ceiling Tile	None Detected
42B		B19757	White	Ceiling Tile	None Detected
43A		B19758A	White	Floor Tile	None Detected
		B19758B	Yellow	Mastic	None Detected
43B		B19759A	White	Floor Tile	None Detected
		B19759B	Yellow	Mastic	None Detected
44A		B19760	White	Gypsum Window Panel	None Detected
44B		B19761	White	Gypsum Window Panel	None Detected
45A		B19762A	Light Gray	Floor Tile	None Detected
		B19762B	Black	Mastic	None Detected
		B19762C	Dark Gray	Floor Tile	None Detected
		B19762D	Yellow	Mastic	None Detected
45B		B19763A	Light Gray	Floor Tile	None Detected
		B19763B	Black	Mastic	None Detected
		B19763C	Dark Gray	Floor Tile	None Detected
		B19763D	Yellow	Mastic	None Detected
46A		B19764A	Blue	Covebase	None Detected
		B19764B	Tan	Mastic	None Detected
46B		B19765A	Blue	Covebase	None Detected
		B19765B	Tan	Mastic	None Detected
47A		B19766	White	Hard Plaster	None Detected
47B		B19767	White	Hard Plaster	None Detected
47C		B19768	White	Hard Plaster	None Detected
47D		B19769	White	Hard Plaster	None Detected
47E		B19770	White	Hard Plaster	None Detected
48A	Layer 1	B19771	Gray	Light Weight Concrete	None Detected
	Layer 2	B19771	Brown	Paper	None Detected
48B	Layer 1	B19772	Gray	Light Weight Concrete	None Detected
	Layer 2	B19772	Brown	Paper	None Detected
49A		B19773	White,Beige	Ceiling Tile - Speckled	None Detected

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Waynesville Elementary, 18510214COLa **LAB CODE:** B191195

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
49B		B19774	White,Beige	Ceiling Tile - Speckled	None Detected
50A		B19775A	Green Mottled	Floor Tile	None Detected
		B19775B	Black	Mastic	None Detected
50B		B19776A	Green Mottled	Floor Tile	None Detected
		B19776B	Black	Mastic	None Detected
51A	Layer 1	B19777	Black	Tar	None Detected
	Layer 2	B19777	Silver,Brown	Paper Insulation	None Detected
51B	Layer 1	B19778	Black	Tar	None Detected
	Layer 2	B19778	Silver,Brown	Paper Insulation	None Detected
51C	Layer 1	B19779	Black	Tar	None Detected
	Layer 2	B19779	Silver,Brown	Paper Insulation	None Detected
52A		B19780	White	Gypsum Window Panel	None Detected
52B		B19781	White	Gypsum Window Panel	None Detected
53A	Layer 1	B19782	White	Drywall	None Detected
	Layer 2	B19782	White	Joint Compound	None Detected
53B	Layer 1	B19783	White	Drywall	None Detected
	Layer 2	B19783	White	Joint Compound	None Detected
54A		B19784A	Gray	Stair Tread	None Detected
		B19784B	Tan	Mastic	None Detected
54B		B19785A	Gray	Stair Tread	None Detected
		B19785B	Tan	Mastic	None Detected
55A		B19786	White,Gray	Hard Plaster Ceiling	None Detected
55B		B19787	White,Gray	Hard Plaster Ceiling	None Detected
55C		B19788	White,Gray	Hard Plaster Ceiling	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
1A B19652	Ceiling Tile	Heterogeneous White Fibrous Bound	65% 20%	Cellulose Fiberglass	15%	Perlite	None Detected
Lab Notes: Samples B19652-B19705 analyzed by Samantha Card.							
1B B19653	Ceiling Tile	Heterogeneous White Fibrous Bound	65% 20%	Cellulose Fiberglass	15% <1%	Perlite Paint	None Detected
2A B19654A	Floor Tile	Homogeneous White Non-fibrous Bound			100%	Vinyl	None Detected
B19654B	Mastic	Heterogeneous Black,Yellow Non-fibrous Bound	<1%	Cellulose	98% 2%	Mastic Binder	None Detected
2B B19655A	Floor Tile	Homogeneous White Non-fibrous Bound			100%	Vinyl	None Detected
B19655B	Mastic	Heterogeneous Black,Yellow Non-fibrous Bound	<1%	Cellulose	98% 2%	Mastic Binder	None Detected
2C B19656A	Floor Tile	Homogeneous White Non-fibrous Bound			100%	Vinyl	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
B19656B	Mastic	Heterogeneous Black,Yellow Non-fibrous Bound	<1%	Cellulose	98% 2%	Mastic Binder	None Detected
2D B19657A	Floor Tile	Homogeneous White Non-fibrous Bound			100%	Vinyl	None Detected
B19657B	Mastic	Heterogeneous Black,Yellow Non-fibrous Bound	<1%	Cellulose	98% 2%	Mastic Binder	None Detected
3A B19658A	Ceiling Tile	Homogeneous Tan Fibrous Bound	100%	Cellulose			None Detected
B19658B	Mastic	Homogeneous Brown Non-fibrous Bound			97%	Mastic	**3% Chrysotile**
3B B19659	Sample Not Analyzed per COC						
4A B19660	Skim Coat	Heterogeneous White Non-fibrous Bound			5% 65% 30%	Paint Calc Carb Binder	None Detected
4B B19661	Skim Coat	Heterogeneous White Non-fibrous Bound			5% 65% 30%	Paint Calc Carb Binder	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
4C B19662	Skim Coat	Heterogeneous White Non-fibrous Bound			5% 65% 30%	Paint Calc Carb Binder	None Detected
4D B19663	Skim Coat	Heterogeneous White Non-fibrous Bound			5% 65% 30%	Paint Calc Carb Binder	None Detected
4E B19664	Skim Coat	Heterogeneous White Non-fibrous Bound			5% 65% 30%	Paint Calc Carb Binder	None Detected
5A Layer 1 B19665	Plaster Skim Coat	Heterogeneous White Non-fibrous Bound			5% 40% 55%	Paint Silicates Binder	None Detected
Layer 2 B19665	Plaster Base Coat	Heterogeneous Gray Non-fibrous Bound	<1%	Cellulose	65% 35%	Silicates Binder	None Detected
5B Layer 1 B19666	Plaster Skim Coat	Heterogeneous White Non-fibrous Bound			5% 40% 55%	Paint Silicates Binder	None Detected
Layer 2 B19666	Plaster Base Coat	Heterogeneous Gray Non-fibrous Bound	<1%	Cellulose	65% 35%	Silicates Binder	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
5C Layer 1 B19667	Plaster Skim Coat	Heterogeneous White Non-fibrous Bound			5% 40% 55%	Paint Silicates Binder	None Detected
Layer 2 B19667	Plaster Base Coat	Heterogeneous Gray Non-fibrous Bound	<1%	Cellulose	65% 35%	Silicates Binder	None Detected
6A B19668	Gypsum Ceiling Tile	Heterogeneous White Fibrous Bound	15%	Cellulose	85%	Gypsum	None Detected
6B B19669	Gypsum Ceiling Tile	Heterogeneous White Fibrous Bound	15%	Cellulose	85%	Gypsum	None Detected
7A B19670A	Floor Tile	Homogeneous Brown,Tan Non-fibrous Bound			97%	Vinyl	**3% Chrysotile**
B19670B	Mastic	Homogeneous Yellow Non-fibrous Bound			100%	Mastic	None Detected
7B B19671	Sample Not Analyzed per COC						
8A B19672A	Floor Tile	Homogeneous Light Gray Non-fibrous Bound			100%	Vinyl	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
B19672B	Mastic	Homogeneous Yellow Non-fibrous Bound			100%	Mastic	None Detected
B19672C	Floor Tile	Homogeneous Dark Gray Non-fibrous Bound	3%	Cellulose	97%	Vinyl	None Detected
B19672D	Mastic	Homogeneous Brown Non-fibrous Bound			98% 2%	Mastic Silicates	None Detected
8B B19673A	Floor Tile	Homogeneous Light Gray Non-fibrous Bound			100%	Vinyl	None Detected
B19673B	Mastic	Homogeneous Yellow Non-fibrous Bound			100%	Mastic	None Detected
B19673C	Floor Tile	Homogeneous Dark Gray Non-fibrous Bound	3%	Cellulose	97%	Vinyl	None Detected
B19673D	Mastic	Homogeneous Brown Non-fibrous Bound			98% 2%	Mastic Silicates	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous	ASBESTOS %
9A B19674A	Floor Tile	Homogeneous Light Blue Non-fibrous Bound	100%	Vinyl	None Detected
B19674B	Mastic	Homogeneous Tan Non-fibrous Bound	100%	Mastic	None Detected
9B B19675A	Floor Tile	Homogeneous Light Blue Non-fibrous Bound	100%	Vinyl	None Detected
B19675B	Mastic	Homogeneous Tan Non-fibrous Bound	100%	Mastic	None Detected
10A B19676	Plaster	Heterogeneous White Non-fibrous Bound	5% 35% 60%	Paint Calc Carb Binder	None Detected
10B Layer 1 B19677	Plaster Skim Coat	Heterogeneous White Non-fibrous Bound	5% 35% 60%	Paint Calc Carb Binder	None Detected
Layer 2 B19677	Plaster Base Coat	Heterogeneous Gray Non-fibrous Bound	65% 35%	Silicates Binder	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
10C	Plaster Skim Coat	Heterogeneous			5%	Paint	None Detected
Layer 1		White			35%	Calc Carb	
B19678		Non-fibrous			60%	Binder	
		Bound					
Layer 2	Plaster Base Coat	Heterogeneous			65%	Silicates	None Detected
B19678		Gray			35%	Binder	
		Non-fibrous					
		Bound					
11A	Ceiling Tile	Heterogeneous	60%	Cellulose	15%	Perlite	None Detected
B19679		White	20%	Fiberglass	5%	Paint	
		Fibrous					
		Bound					
11B	Ceiling Tile	Heterogeneous	60%	Cellulose	15%	Perlite	None Detected
B19680		White	20%	Fiberglass	5%	Paint	
		Fibrous					
		Bound					
12A	Gypsum Window Panel	Heterogeneous	10%	Cellulose	90%	Gypsum	None Detected
B19681		White	<1%	Fiberglass	<1%	Mica	
		Fibrous					
		Loosely Bound					
12B	Gypsum Window Panel	Heterogeneous	10%	Cellulose	90%	Gypsum	None Detected
B19682		White	<1%	Fiberglass	<1%	Mica	
		Fibrous					
		Loosely Bound					
13A	Lightweight Concrete	Heterogeneous			65%	Silicates	None Detected
Layer 1		Gray			35%	Binder	
B19683		Non-fibrous					
		Bound					

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
Layer 2 B19683	Paper	Heterogeneous Brown Fibrous Bound	95%	Cellulose	5%	Binder	None Detected
13B Layer 1 B19684	Lightweight Concrete	Heterogeneous Gray Non-fibrous Bound			65% 35%	Silicates Binder	None Detected
Layer 2 B19684	Paper	Heterogeneous Brown Fibrous Bound	95%	Cellulose	5%	Binder	None Detected
14A B19685	Lightweight Concrete	Heterogeneous Gray Non-fibrous Bound	<1%	Cellulose	25% 75%	Silicates Binder	None Detected
14B B19686	Lightweight Concrete	Heterogeneous Gray Non-fibrous Bound	<1%	Cellulose	25% 75%	Silicates Binder	None Detected
15A B19687A	Floor Tile	Homogeneous Off-white Non-fibrous Bound			98%	Vinyl	**2% Chrysotile**
B19687B	Mastic	Homogeneous Tan Non-fibrous Bound			100%	Mastic	None Detected
15B B19688	Sample Not Analyzed per COC						

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
16A	Plaster Skim Coat	Heterogeneous			5%	Paint	None Detected
Layer 1		Cream			40%	Silicates	
B19689		Non-fibrous			55%	Binder	
		Bound					
Layer 2	Plaster Base Coat	Heterogeneous	<1%	Hair	65%	Silicates	None Detected
B19689		Gray			35%	Binder	
		Non-fibrous					
		Bound					
16B	Plaster	Heterogeneous			5%	Paint	None Detected
B19690		Cream			40%	Silicates	
		Non-fibrous			55%	Binder	
		Bound					
16C	Plaster	Heterogeneous			5%	Paint	None Detected
B19691		Cream			40%	Silicates	
		Non-fibrous			55%	Binder	
		Bound					
16D	Plaster Skim Coat	Heterogeneous			60%	Binder	None Detected
Layer 1		Cream			40%	Silicates	
B19692		Non-fibrous					
		Bound					
Layer 2	Plaster Base Coat	Heterogeneous			65%	Silicates	None Detected
B19692		Gray			35%	Binder	
		Non-fibrous					
		Bound					
16E	Plaster Skim Coat	Heterogeneous			5%	Paint	None Detected
Layer 1		Cream			40%	Silicates	
B19693		Non-fibrous			55%	Binder	
		Bound					

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
Layer 2 B19693	Plaster Base Coat	Heterogeneous Gray Non-fibrous Bound	<1%	Hair	65% 35%	Silicates Binder	None Detected
17A B19694A	Floor Tile	Homogeneous Beige Non-fibrous Bound			90%	Vinyl	**10% Chrysotile**
B19694B	Mastic	Homogeneous Black Non-fibrous Bound			100%	Mastic	None Detected
B19694C	Floor Tile	Homogeneous Maroon Non-fibrous Bound			90%	Vinyl	**10% Chrysotile**
B19694D	Mastic	Homogeneous Black Non-fibrous Bound			100%	Mastic	None Detected
17B B19695	Sample Not Analyzed per COC						
18A B19696	Hard Plaster Ceiling	Heterogeneous White,Gray Non-fibrous Bound	<1%	Hair	5% 65% 30%	Paint Silicates Binder	<1% Chrysotile
18B B19697	Hard Plaster Ceiling	Heterogeneous White,Gray Non-fibrous Bound	<1%	Hair	5% 65% 30%	Paint Silicates Binder	<1% Chrysotile

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
18C B19698	Hard Plaster Ceiling	Heterogeneous White,Gray Non-fibrous Bound	<1% 	Hair 	5% 65% 30%	Paint Silicates Binder	<1% Chrysotile
18D B19699	Hard Plaster Ceiling	Heterogeneous White,Gray Non-fibrous Bound	<1% 	Hair 	5% 65% 30%	Paint Silicates Binder	<1% Chrysotile
18E B19700	Hard Plaster Ceiling	Heterogeneous White,Gray Non-fibrous Bound	<1% 	Hair 	5% 65% 30%	Paint Silicates Binder	<1% Chrysotile
19A B19701	Ceiling Texture (Plaster)	Heterogeneous Gray Non-fibrous Bound	<1% 	Hair 	5% 65% 30%	Paint Silicates Binder	<1% Chrysotile
19B B19702	Ceiling Texture (Plaster)	Heterogeneous Gray Non-fibrous Bound	<1% 	Hair 	5% 65% 30%	Paint Silicates Binder	<1% Chrysotile
19C B19703	Ceiling Texture (Plaster)	Heterogeneous Gray Non-fibrous Bound	<1% 	Hair 	5% 65% 30%	Paint Silicates Binder	<1% Chrysotile
19D B19704	Ceiling Texture (Plaster)	Heterogeneous Gray Non-fibrous Bound	<1% 	Hair 	5% 65% 30%	Paint Silicates Binder	<1% Chrysotile

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
19E B19705	Ceiling Texture (Plaster)	Heterogeneous Gray Non-fibrous Bound	<1%	Hair	5% 65% 30%	Paint Silicates Binder	<1% Chrysotile
20A B19706	Transite Window Panel	Homogeneous White Fibrous Bound			85%	Binder	**15% Chrysotile**
Lab Notes: Samples B19706-B19765 analyzed by Greg Ruff.							
20B B19707	Sample Not Analyzed per COC						
21A B19708	Covebase	Homogeneous Black Non-fibrous Bound			100%	Vinyl	None Detected
21B B19709	Covebase	Homogeneous Black Non-fibrous Bound			100%	Vinyl	None Detected
22A B19710A	Floor Tile	Homogeneous Green Fibrous Bound			75% 20%	Vinyl Calc Carb	**5% Chrysotile**
B19710B	Mastic	Homogeneous Yellow Non-fibrous Bound			100%	Mastic	None Detected
22B B19711	Sample Not Analyzed per COC						

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous		ASBESTOS %
23A B19712A	Floor Tile	Homogeneous Beige Fibrous Bound		70% 20%	Vinyl Calc Carb	**10% Chrysotile**
B19712B	Mastic	Homogeneous Black Non-fibrous Bound		100%	Mastic	None Detected
B19712C	Floor Tile	Homogeneous Maroon Fibrous Bound		70% 20%	Vinyl Calc Carb	**10% Chrysotile**
B19712D	Mastic	Homogeneous Black Non-fibrous Bound		100%	Mastic	None Detected
23B B19713	Sample Not Analyzed per COC					
24A Layer 1 B19714	Plasterboard Skim Coat	Homogeneous Blue,White Non-fibrous Bound		10% 35% 55%	Paint Silicates Calc Carb	None Detected
Layer 2 B19714	Plasterboard Base Coat	Homogeneous Off-white Non-fibrous Bound		70% 30%	Binder Perlite	None Detected
24B Layer 1 B19715	Plasterboard Skim Coat	Homogeneous Blue,White Non-fibrous Bound		10% 35% 55%	Paint Silicates Calc Carb	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
Layer 2 B19715	Plasterboard Base Coat	Homogeneous Off-white Non-fibrous Bound			70% 30%	Binder Perlite	None Detected
25A B19716	Ceiling Tile	Heterogeneous White Fibrous Loosely Bound	35% 35%	Cellulose Fiberglass	5% 25%	Paint Perlite	None Detected
25B B19717	Ceiling Tile	Heterogeneous White Fibrous Loosely Bound	35% 35%	Cellulose Fiberglass	5% 25%	Paint Perlite	None Detected
26A B19718A	Stair Tread	Homogeneous Red Non-fibrous Bound			100%	Vinyl	None Detected
B19718B	Mastic	Homogeneous Yellow Non-fibrous Bound			100%	Mastic	None Detected
26B B19719A	Stair Tread	Homogeneous Red Non-fibrous Bound			100%	Vinyl	None Detected
B19719B	Mastic	Homogeneous Yellow Non-fibrous Bound			100%	Mastic	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		NON-ASBESTOS COMPONENTS Non-Fibrous		ASBESTOS %
27A B19720	Carpet Mastic	Homogeneous Yellow Fibrous Bound	2%	Synthetic Fiber	98%	Mastic	None Detected
27B B19721	Carpet Mastic	Homogeneous Yellow Fibrous Bound	2%	Synthetic Fiber	98%	Mastic	None Detected
28A B19722A	Sheet Floor	Heterogeneous Tan Non-fibrous Bound			100%	Vinyl	None Detected
B19722B	Mastic	Heterogeneous Yellow Non-fibrous Bound			90% 10%	Mastic Paint	None Detected
28B B19723A	Sheet Floor	Heterogeneous Tan Non-fibrous Bound			100%	Vinyl	None Detected
B19723B	Mastic	Heterogeneous Yellow Non-fibrous Bound			90% 10%	Mastic Paint	None Detected
29A B19724A	Sheet Floor	Heterogeneous Beige Fibrous Bound			50% 25%	Vinyl Binder	**25% Chrysotile**

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous		ASBESTOS %
B19724B	Mastic	Heterogeneous Brown Fibrous Bound		97%	Mastic	3% Chrysotile
Lab Notes: Probable contamination from positive sheet floor						
29B B19725	Sample Not Analyzed per COC					
30A B19726A	Sheet Floor	Homogeneous Light Green Non-fibrous Bound		100%	Vinyl	None Detected
B19726B	Mastic	Homogeneous Yellow Non-fibrous Bound		100%	Mastic	None Detected
30B B19727A	Sheet Floor	Homogeneous Light Green Non-fibrous Bound		100%	Vinyl	None Detected
B19727B	Mastic	Homogeneous Yellow Non-fibrous Bound		100%	Mastic	None Detected
31A B19728A	Covebase	Homogeneous Cream Non-fibrous Bound		100%	Vinyl	None Detected
B19728B	Mastic	Homogeneous Yellow Non-fibrous Bound		100%	Mastic	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
31B B19729A	Covebase	Homogeneous Cream Non-fibrous Bound			100%	Vinyl	None Detected
B19729B	Mastic	Homogeneous Yellow Non-fibrous Bound			100%	Mastic	None Detected
32A B19730	Carpet Mastic	Homogeneous Yellow Fibrous Bound	3%	Synthetic Fiber	97%	Mastic	None Detected
32B B19731	Carpet Mastic	Homogeneous Yellow Fibrous Bound	3%	Synthetic Fiber	97%	Mastic	None Detected
33A B19732A	Floor Tile	Homogeneous Green Fibrous Bound			70% 20%	Vinyl Calc Carb	**10% Chrysotile**
B19732B	Mastic	Homogeneous Black Fibrous Bound			95%	Mastic	**5% Chrysotile**
33B B19733	Sample Not Analyzed per COC						
34A B19734A	Sheet Floor	Heterogeneous Beige Fibrous Bound	30%	Cellulose	70%	Vinyl	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
B19734B	Mastic	Heterogeneous Yellow Fibrous Bound	3%	Cellulose	97%	Mastic	None Detected
34B B19735A	Sheet Floor	Heterogeneous Beige Fibrous Bound	30%	Cellulose	70%	Vinyl	None Detected
B19735B	Mastic	Heterogeneous Yellow Fibrous Bound	3%	Cellulose	97%	Mastic	None Detected
35A B19736	Hard Plaster	Heterogeneous White,Gray Fibrous Bound	<1%	Hair	5% 40% 55%	Paint Binder Silicates	<1% Chrysotile
35B B19737	Hard Plaster	Heterogeneous White,Gray Fibrous Bound	<1%	Hair	5% 40% 55%	Paint Binder Silicates	<1% Chrysotile
35C B19738	Hard Plaster	Heterogeneous White Non-fibrous Bound			5% 55% 40%	Paint Calc Carb Silicates	None Detected
35D B19739	Hard Plaster	Heterogeneous White,Gray Fibrous Bound	<1%	Hair	5% 40% 55%	Paint Binder Silicates	<1% Chrysotile

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous		ASBESTOS %
35E B19740	Hard Plaster	Heterogeneous White Non-fibrous Bound		5% 55% 40%	Paint Calc Carb Silicates	None Detected
35F B19741	Hard Plaster	Heterogeneous White Non-fibrous Bound		5% 55% 40%	Paint Calc Carb Silicates	None Detected
35G B19742	Hard Plaster	Heterogeneous White Non-fibrous Bound		5% 55% 40%	Paint Calc Carb Silicates	None Detected
36A B19743A	Covebase	Homogeneous Black Non-fibrous Bound		100%	Vinyl	None Detected
B19743B	Mastic	Homogeneous Yellow Non-fibrous Bound		100%	Mastic	None Detected
36B B19744A	Covebase	Homogeneous Black Non-fibrous Bound		100%	Vinyl	None Detected
B19744B	Mastic	Homogeneous Yellow Non-fibrous Bound		100%	Mastic	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
37A B19745	Ceiling Tile	Heterogeneous White,Gray Fibrous Loosely Bound	35% 50%	Cellulose Fiberglass	5% 10%	Paint Perlite	None Detected
37B B19746	Ceiling Tile	Heterogeneous White,Gray Fibrous Loosely Bound	35% 50%	Cellulose Fiberglass	5% 10%	Paint Perlite	None Detected
38A B19747	Ceiling Texture - Sponge	Homogeneous White Non-fibrous Bound			5% 35% 60%	Paint Binder Calc Carb	None Detected
38B B19748	Ceiling Texture - Sponge	Homogeneous White Non-fibrous Bound			5% 35% 60%	Paint Binder Calc Carb	None Detected
38C B19749	Ceiling Texture - Sponge	Homogeneous White Non-fibrous Bound			5% 35% 60%	Paint Binder Calc Carb	None Detected
39A B19750A	Floor Tile	Homogeneous White Non-fibrous Bound			90% 10%	Vinyl Calc Carb	None Detected
B19750B	Mastic	Homogeneous Clear Non-fibrous Bound			100%	Mastic	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous		ASBESTOS %
39B B19751A	Floor Tile	Homogeneous White Non-fibrous Bound		90% 10%	Vinyl Calc Carb	None Detected
B19751B	Mastic	Homogeneous Clear Non-fibrous Bound		100%	Mastic	None Detected
40A B19752A	Floor Tile	Homogeneous Tan Non-fibrous Bound		80% 20%	Vinyl Calc Carb	None Detected
B19752B	Mastic	Homogeneous Clear Non-fibrous Bound		90% 10%	Mastic Silicates	None Detected
40B B19753A	Floor Tile	Homogeneous Tan Non-fibrous Bound		80% 20%	Vinyl Calc Carb	None Detected
B19753B	Mastic	Homogeneous Clear Non-fibrous Bound		90% 10%	Mastic Silicates	None Detected
41A B19754	Ceiling Mastic	Homogeneous Brown Non-fibrous Bound		100%	Mastic	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
41B B19755	Ceiling Mastic	Homogeneous Brown Non-fibrous Bound			100%	Mastic	None Detected
42A B19756	Ceiling Tile	Heterogeneous White Fibrous Loosely Bound	35% 35%	Cellulose Fiberglass	5% 25%	Paint Perlite	None Detected
42B B19757	Ceiling Tile	Heterogeneous White Fibrous Loosely Bound	35% 35%	Cellulose Fiberglass	5% 25%	Paint Perlite	None Detected
43A B19758A	Floor Tile	Homogeneous White Non-fibrous Bound			80% 20%	Vinyl Calc Carb	None Detected
B19758B	Mastic	Homogeneous Yellow Non-fibrous Bound			100%	Mastic	None Detected
43B B19759A	Floor Tile	Homogeneous White Non-fibrous Bound			80% 20%	Vinyl Calc Carb	None Detected
B19759B	Mastic	Homogeneous Yellow Non-fibrous Bound			100%	Mastic	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
44A B19760	Gypsum Window Panel	Heterogeneous White Fibrous Bound	10% <1%	Cellulose Fiberglass	90% <1%	Gypsum Mica	None Detected
44B B19761	Gypsum Window Panel	Heterogeneous White Fibrous Bound	10% <1%	Cellulose Fiberglass	90% <1%	Gypsum Mica	None Detected
45A B19762A	Floor Tile	Homogeneous Light Gray Non-fibrous Bound			80% 20%	Vinyl Calc Carb	None Detected
B19762B	Mastic	Homogeneous Black Fibrous Bound	5%	Cellulose	95%	Mastic	None Detected
B19762C	Floor Tile	Homogeneous Dark Gray Non-fibrous Bound			80% 20%	Vinyl Calc Carb	None Detected
B19762D	Mastic	Homogeneous Yellow Fibrous Bound	5%	Cellulose	95%	Mastic	None Detected
45B B19763A	Floor Tile	Homogeneous Light Gray Non-fibrous Bound			80% 20%	Vinyl Calc Carb	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
B19763B	Mastic	Homogeneous Black Fibrous Bound	5%	Cellulose	95%	Mastic	None Detected
B19763C	Floor Tile	Homogeneous Dark Gray Non-fibrous Bound			80% 20%	Vinyl Calc Carb	None Detected
B19763D	Mastic	Homogeneous Yellow Fibrous Bound	5%	Cellulose	95%	Mastic	None Detected
46A B19764A	Covebase	Homogeneous Blue Non-fibrous Bound			100%	Vinyl	None Detected
B19764B	Mastic	Homogeneous Tan Non-fibrous Bound			100%	Mastic	None Detected
46B B19765A	Covebase	Homogeneous Blue Non-fibrous Bound			100%	Vinyl	None Detected
B19765B	Mastic	Homogeneous Tan Non-fibrous Bound			100%	Mastic	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
47A B19766	Hard Plaster	Heterogeneous White Fibrous Bound	<1%	Cellulose	3% 60% 37%	Paint Binder Silicates	None Detected
Lab Notes: Samples B19766 through B19788 analyzed by Shilpa Ladekar.							
47B B19767	Hard Plaster	Heterogeneous White Fibrous Bound	<1%	Cellulose	3% 60% 37%	Paint Binder Silicates	None Detected
47C B19768	Hard Plaster	Heterogeneous White Fibrous Bound	<1%	Cellulose	3% 60% 37%	Paint Binder Silicates	None Detected
47D B19769	Hard Plaster	Heterogeneous White Fibrous Bound	<1%	Cellulose	3% 60% 37%	Paint Binder Silicates	None Detected
47E B19770	Hard Plaster	Heterogeneous White Fibrous Bound	<1%	Cellulose	3% 60% 37%	Paint Binder Silicates	None Detected
48A Layer 1 B19771	Light Weight Concrete	Homogeneous Gray Fibrous Bound	<1%	Cellulose	60% 40%	Binder Silicates	None Detected
Layer 2 B19771	Paper	Homogeneous Brown Fibrous Bound	85%	Cellulose	15%	Tar	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
48B Layer 1 B19772	Light Weight Concrete	Homogeneous Gray Fibrous Bound	<1%	Cellulose	60% 40%	Binder Silicates	None Detected
Layer 2 B19772	Paper	Homogeneous Brown Fibrous Bound	85%	Cellulose	15%	Tar	None Detected
49A B19773	Ceiling Tile - Speckled	Heterogeneous White,Beige Fibrous Loosely Bound	65% 10%	Cellulose Fiberglass	5% 20%	Paint Perlite	None Detected
49B B19774	Ceiling Tile - Speckled	Heterogeneous White,Beige Fibrous Loosely Bound	65% 10%	Cellulose Fiberglass	5% 20%	Paint Perlite	None Detected
50A B19775A	Floor Tile	Homogeneous Green Mottled Fibrous Bound	2%	Cellulose	60% 38%	Vinyl Calc Carb	None Detected
B19775B	Mastic	Homogeneous Black Fibrous Bound	5%	Cellulose	60% 35%	Mastic Calc Carb	None Detected
50B B19776A	Floor Tile	Homogeneous Green Mottled Fibrous Bound	2%	Cellulose	60% 38%	Vinyl Calc Carb	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
B19776B	Mastic	Homogeneous Black Fibrous Bound	5%	Cellulose	60% 35%	Mastic Calc Carb	None Detected
51A Layer 1 B19777	Tar	Homogeneous Black Fibrous Bound	2%	Cellulose	98%	Tar	None Detected
Layer 2 B19777	Paper Insulation	Heterogeneous Silver,Brown Fibrous Bound	80%	Cellulose	20%	Metal Foil	None Detected
51B Layer 1 B19778	Tar	Homogeneous Black Fibrous Bound	2%	Cellulose	98%	Tar	None Detected
Layer 2 B19778	Paper Insulation	Heterogeneous Silver,Brown Fibrous Bound	80%	Cellulose	20%	Metal Foil	None Detected
51C Layer 1 B19779	Tar	Homogeneous Black Fibrous Bound	2%	Cellulose	98%	Tar	None Detected
Layer 2 B19779	Paper Insulation	Heterogeneous Silver,Brown Fibrous Bound	80%	Cellulose	20%	Metal Foil	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
52A B19780	Gypsum Window Panel	Heterogeneous White Fibrous Bound	10%	Cellulose	90%	Gypsum	None Detected
52B B19781	Gypsum Window Panel	Heterogeneous White Fibrous Bound	10%	Cellulose	90%	Gypsum	None Detected
53A Layer 1 B19782	Drywall	Heterogeneous White Fibrous Bound	10%	Cellulose	3% 87%	Paint Gypsum	None Detected
Layer 2 B19782	Joint Compound	Heterogeneous White Fibrous Bound	2%	Cellulose	5% 93%	Paint Calc Carb	None Detected
53B Layer 1 B19783	Drywall	Heterogeneous White Fibrous Bound	10%	Cellulose	3% 87%	Paint Gypsum	None Detected
Layer 2 B19783	Joint Compound	Heterogeneous White Fibrous Bound	2%	Cellulose	5% 93%	Paint Calc Carb	None Detected
54A B19784A	Stair Tread	Homogeneous Gray Fibrous Bound	2%	Cellulose	98%	Vinyl	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195
Date Received: 02-22-19
Date Analyzed: 03-04-19
Date Reported: 03-04-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
B19784B	Mastic	Homogeneous Tan Fibrous Bound	5%	Cellulose	60% 35%	Mastic Calc Carb	None Detected
54B B19785A	Stair Tread	Homogeneous Gray Fibrous Bound	2%	Cellulose	98%	Vinyl	None Detected
B19785B	Mastic	Homogeneous Tan Fibrous Bound	5%	Cellulose	60% 35%	Mastic Calc Carb	None Detected
55A B19786	Hard Plaster Ceiling	Heterogeneous White,Gray Fibrous Bound	<1%	Cellulose	3% 60% 37%	Paint Binder Silicates	None Detected
55B B19787	Hard Plaster Ceiling	Heterogeneous White,Gray Fibrous Bound	<1%	Cellulose	3% 60% 37%	Paint Binder Silicates	None Detected
55C B19788	Hard Plaster Ceiling	Heterogeneous White,Gray Fibrous Bound	<1%	Cellulose	3% 60% 37%	Paint Binder Silicates	None Detected

eurofins | CEI

LEGEND: Non-Anth = Non-Asbestiform Anthophyllite
Non-Trem = Non-Asbestiform Tremolite
Calc Carb = Calcium Carbonate

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

REPORTING LIMIT: <1% by visual estimation

REPORTING LIMIT FOR POINT COUNTS: 0.25% by 400 Points or 0.1% by 1,000 Points

REGULATORY LIMIT: >1% by weight

Due to the limitations of the EPA 600 method, nonfriable organically bound materials (NOBs) such as vinyl floor tiles can be difficult to analyze via polarized light microscopy (PLM). EPA recommends that all NOBs analyzed by PLM, and found not to contain asbestos, be further analyzed by Transmission Electron Microscopy (TEM). Please note that PLM analysis of dust and soil samples for asbestos is not covered under NVLAP accreditation. *Estimated measurement of uncertainty is available on request.*

This report relates only to the samples tested or analyzed and may not be reproduced, except in full, without written approval by Eurofins CEI. Eurofins CEI makes no warranty representation regarding the accuracy of client submitted information in preparing and presenting analytical results. Interpretation of the analytical results is the sole responsibility of the client. Samples were received in acceptable condition unless otherwise noted. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Information provided by customer includes customer sample ID, location, volume and area as well as date and time of sampling.

ANALYST: Samantha Card

APPROVED BY: Tianbao Bai, Ph.D., CIH
Laboratory Director

Greg Ruff

NVLAP TESTING
NVLAP LAB CODE 101768-0

B191195
B19652-B19788

ASBESTOS CHAIN OF CUSTODY

CEI LABS
730 SE Maynard Road, Cary, NC 27511
Tel: 866-481-1412; Fax: 919-481-1442

LAB USE ONLY:	
CEI Lab Code:	B191195
CEI Lab I.D. Range:	B19652-B19788 (137)

COMPANY INFORMATION	PROJECT INFORMATION
CEI CLIENT #:	Job Contact: Matt McClelland
Company: CTL Engineering	Email / Tel: same
Address: 2860 Fisher Road	Project Name: Waynesville Elementary
Columbus, OH 43204	Project ID#: 18510214COLa
Email: MMcclelland@ctleng.com	PO #: 42330
Tel: 614-824-3527 Fax:	STATE SAMPLES COLLECTED IN: OH

IF TAT IS NOT MARKED STANDARD 3 DAY TAT APPLIES.

ASBESTOS	METHOD	TURN AROUND TIME					
		4 HR	8 HR	24 HR	2 DAY	3 DAY	5 DAY
PLM BULK	EPA 600	☐	☐	☐	☐	☐	☒
PLM POINT COUNT (400)	EPA 600	☐	☐	☐	☐	☐	☐
PLM POINT COUNT (1000)	EPA 600	☐	☐	☐	☐	☐	☐
PLM GRAV w POINT COUNT	EPA 600		☐	☐	☐	☐	☐
PLM BULK	CARB 435		☐	☐	☐	☐	☐
PCM AIR	NIOSH 7400	☐	☐	☐	☐	☐	☐
TEM AIR	EPA AHERA	☐	☐	☐	☐	☐	☐
TEM AIR	NIOSH 7402	☐	☐	☐	☐	☐	☐
TEM AIR	ISO 10312	☐	☐	☐	☐	☐	☐
TEM AIR	ASTM 6281-09	☐	☐	☐	☐	☐	☐
TEM BULK	CHATFIELD		☐	☐	☐	☐	☐
TEM DUST WIPE	ASTM D6480-05 (2010)	☐	☐	☐	☐	☐	☐
TEM DUST MICROVAC	ASTM D5755-09 (2014)	☐	☐	☐	☐	☐	☐
TEM SOIL	ASTM D7521-13			☐	☐	☐	☐
TEM VERMICULITE	CINCINNATI METHOD			☐	☐	☐	☐
OTHER:		☐	☐	☐	☐	☐	☐

REMARKS / SPECIAL INSTRUCTIONS:
First positive stop by material/layer
Composite drywall/joint comp. samples if >1% asbestos
PO# 42330 must be on invoice

☒ Accept Samples
☐ Reject Samples

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	2/21/19 @ 13:00	VC	2/22/19 9:20am

Samples will be disposed of 30 days after analysis

ASBESTOS SAMPLING FORM

B191195

COMPANY CONTACT INFORMATION	
Company: CTL Engineering	Job Contact: Matt McClelland
Project Name: Waynesville Elementary	MMcclelland@CTLeng.com
Project ID #: 185102I4COLa	Tel: 614-824-3527

SAMPLE ID#	DESCRIPTION / LOCATION	VOLUME/ AREA	TEST	
1A/B	2x4 ceiling tile - large/small pinhole		PLM ☒	TEM ☐
2A/B/C/D	12" white floor tile/black mastic		PLM ☐	TEM ☐
3A/B	1x1 ceiling tile/brown mastic		PLM ☐	TEM ☐
4A/B/C/D/E	skim coat		PLM ☐	TEM ☐
5A/B/C/~~D/E~~ MM	hard plaster		PLM ☐	TEM ☐
6A/B	2x4 ceiling tile - gypsum		PLM ☐	TEM ☐
7A/B	9" brown/tan floor tile/yellow mastic		PLM ☐	TEM ☐
8A/B	9" Light/dark gray floor tile/mastic		PLM ☐	TEM ☐
9A/B	12" Lt. blue floor tile/mastic		PLM ☐	TEM ☐
10A/B/C	hard plaster II		PLM ☐	TEM ☐
11A/B	2x4 ceiling tile - bird track		PLM ☐	TEM ☐
12A/B	gypsum window panels		PLM ☐	TEM ☐
13A/B	Light weight concrete		PLM ☐	TEM ☐
14A/B	Light weight concrete II		PLM ☐	TEM ☐
15A/B	9" off-white floor tile/mastic		PLM ☐	TEM ☐
16A/B/C/D/E/~~F/G~~ MM	hard plaster III		PLM ☐	TEM ☐
17A/B	9" beige/maroon floor tile/mastic		PLM ☐	TEM ☐
18A/B/C/D/E/~~F/G~~ MM	hard plaster ceilings		PLM ☐	TEM ☐
19A/B/C/D/E	Ceiling texture II		PLM ☐	TEM ☐
20A/B	transite window panel		PLM ☐	TEM ☐
21A/B	black cove base		PLM ☐	TEM ☐
22A/B	12" green floor tile/mastic		PLM ☐	TEM ☐
23A/B	9" beige/maroon floor tile/mastic II		PLM ☐	TEM ☐
24A/B	Plaster board		PLM ☐	TEM ☐
25A/B	2x4 ceiling tile - pinhole		PLM ☐	TEM ☐
26A/B	red stair tread		PLM ☐	TEM ☐
27A/B	yellow carpet mastic		PLM ☐	TEM ☐
28A/B	tan vinyl sheet floor		PLM ☐	TEM ☐

ASBESTOS SAMPLING FORM

CEI LABS

B191195

COMPANY CONTACT INFORMATION	
Company: CTL Engineering	Job Contact: Matt McClelland
Project Name: Waynesville Elementary	MMcclelland@CTLeng.com
Project ID #: 185102I4COLA	Tel: 614-824-3527

SAMPLE ID#	DESCRIPTION / LOCATION	VOLUME/ AREA	TEST	
29A/B	beige square sheet floor		PLM ☒	TEM ☐
30A/B	Light green sheet floor		PLM ☐	TEM ☐
31A/B	Cream cove base/mastic		PLM ☐	TEM ☐
32A/B	Yellow carpet mastic II		PLM ☐	TEM ☐
33A/B	9" green floor tile/mastic		PLM ☐	TEM ☐
34A/B	beige pattern sheet floor		PLM ☐	TEM ☐
35A/B/C/D/E/F/G	hard plaster IV		PLM ☐	TEM ☐
36A/B	black cove base II/mastic		PLM ☐	TEM ☐
37A/B	2x4 ceiling tile- bumpy		PLM ☐	TEM ☐
38A/B/C	ceiling texture- sponge		PLM ☐	TEM ☐
39A/B	12" white triangle floor tile- P+S		PLM ☐	TEM ☐
40A/B	12" tan square floor tile/mastic		PLM ☐	TEM ☐
41A/B	brown ceiling mastic		PLM ☐	TEM ☐
42A/B	2x4 ceiling tile- speckled		PLM ☐	TEM ☐
43A/B	12" white floor tile II/mastic		PLM ☐	TEM ☐
44A/B	gypsum window panels II		PLM ☐	TEM ☐
45A/B	12" light/dark gray floor tile/mastic		PLM ☐	TEM ☐
46A/B	brown cove base/mastic		PLM ☐	TEM ☐
47A/B/C/D/E	hard plaster V		PLM ☐	TEM ☐
48A/B	light weight concrete III		PLM ☐	TEM ☐
49A/B	2x4 ceiling tile- speckled II		PLM ☐	TEM ☐
50A/B	12" green mottled floor tile/mastic		PLM ☐	TEM ☐
51A/B/C	black tarcon brown paper insulation		PLM ☐	TEM ☐
52A/B	gypsum window panel III		PLM ☐	TEM ☐
53A/B	drywall/joint compound		PLM ☐	TEM ☐
54A/B	gray stair tread/mastic		PLM ☐	TEM ☐
55A/B/C	hard plaster ceiling II		PLM ☐	TEM ☐
			PLM ☐	TEM ☐

eurofins | CEI

March 14, 2019

CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

CLIENT PROJECT: Waynesville Elementary, 18510214COLa (Point Count)
CEI LAB CODE: B191195A

Dear Customer:

Enclosed are asbestos analysis results for PLM bulk samples received at our laboratory on March 5, 2019. The samples were analyzed for asbestos using polarized light microscopy (PLM) point count per the EPA 600 Method.

Sample results containing > 1% asbestos are considered asbestos-containing materials (ACMs) per the EPA regulatory requirements. The detection limit for the EPA 600 method is 0.25% for 400 point counts, or 0.1% for 1,000 point counts.

Thank you for your business and we look forward to continuing good relations.

Kind Regards,

Tianbao Bai, Ph.D., CIH
Laboratory Director

NVLAP TESTING
NVLAP LAB CODE 101768-0

eurofins | CEI

ASBESTOS ANALYTICAL REPORT
By: Polarized Light Microscopy

Prepared for

CTL Engineering, Inc

CLIENT PROJECT:	Waynesville Elementary, 18510214COLa (Point Count)
LAB CODE:	B191195A
TEST METHOD:	PLM Point Count EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020
REPORT DATE:	03/14/19

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191195A
Date Received: 03-05-19
Date Analyzed: 03-14-19
Date Reported: 03-14-19

Project: Waynesville Elementary, 18510214COLa (Point Count)

ASBESTOS POINT COUNT PLM, EPA 600 METHOD

Client ID	Lab ID	Material Description	POINTS Total	POINTS Asbestos	ASBESTOS %	
18A	B19696	Hard Plaster Ceiling	400	2	**0.50%**	**Chrysotile**
18B	B19697	Hard Plaster Ceiling	400	3	**0.75%**	**Chrysotile**
18C	B19698	Hard Plaster Ceiling	400	1	**0.25%**	**Chrysotile**
18D	B19699	Hard Plaster Ceiling	400	1	**0.25%**	**Chrysotile**
18E	B19700	Hard Plaster Ceiling	400	2	**0.50%**	**Chrysotile**
19A	B19701	Ceiling Texture (Plaster)	400	0	**<0.25%**	**Chrysotile**
Lab Notes: Chrysotile detected below limit of quantitation; Chrysotile <0.25%						
19B	B19702	Ceiling Texture (Plaster)	400	2	**0.50%**	**Chrysotile**
19C	B19703	Ceiling Texture (Plaster)	400	2	**0.50%**	**Chrysotile**
19D	B19704	Ceiling Texture (Plaster)	400	1	**0.25%**	**Chrysotile**
19E	B19705	Ceiling Texture (Plaster)	400	3	**0.75%**	**Chrysotile**
35A	B19736	Hard Plaster	400	1	**0.25%**	**Chrysotile**
35B	B19737	Hard Plaster	400	0	**<0.25%**	**Chrysotile**
Lab Notes: Chrysotile detected below the limit of quantitation; Chrysotile <0.25%						
35D	B19739	Hard Plaster	400	1	**0.25%**	**Chrysotile**

LEGEND: None

METHOD: EPA 600 / M4 / 82 / 020 (40 CFR Part 763, Sub. E, App. E)

REPORTING LIMIT: 0.25% by 400 points or 0.1% by 1,000 points

REGULATORY LIMIT: >1% by weight

This report relates only to the samples tested or analyzed and may not be reproduced, except in full, without written approval by Eurofins CEI. Eurofins CEI makes no warranty representation regarding the accuracy of client submitted information in preparing and presenting analytical results. Interpretation of the analytical results is the sole responsibility of the client. Samples were received in acceptable condition unless otherwise noted. *Estimated measurement of uncertainty is available on request.* This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Information provided by customer includes customer sample ID, location, volume and area as well as date and time of sampling.

ANALYST: Samantha Card

APPROVED BY: Tianbao Bai, Ph.D., CIH
Laboratory Director

Greg Ruff

NVLAP TESTING
NVLAP LAB CODE 101768-0

eurofins | CEI

April 5, 2019

CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

CLIENT PROJECT: Waynesville Elementary, 18510214COLa
CEI LAB CODE: B191699

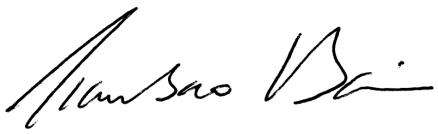
Dear Customer:

Enclosed are asbestos analysis results for PLM Bulk samples received at our laboratory on March 22, 2019. The samples were analyzed for asbestos using polarizing light microscopy (PLM) per the EPA 600 Method.

Sample results containing >1% asbestos are considered asbestos-containing materials (ACMs) per EPA regulatory requirements. The detection limit for the EPA 600 Method is <1% asbestos by weight as determined by visual estimation.

Thank you for your business and we look forward to continuing good relations.

Kind Regards,



Tianbao Bai, Ph.D., CIH
Laboratory Director

NVLAP TESTING
NVLAP LAB CODE 101768-0

eurofins | CEI

ASBESTOS ANALYTICAL REPORT
By: Polarized Light Microscopy

Prepared for

CTL Engineering, Inc

CLIENT PROJECT: Waynesville Elementary, 18510214COLa

LAB CODE: B191699

TEST METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

REPORT DATE: 04/05/19

TOTAL SAMPLES ANALYZED: 83

SAMPLES >1% ASBESTOS: 4

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Waynesville Elementary, 18510214COLa **LAB CODE:** B191699

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
10D		B29277	White	Plaster	None Detected
18F		B29278	White	Plaster	None Detected
18G		B29279	White	Plaster	None Detected
43C		B29280A	White	Floor Tile	None Detected
	Layer 1	B29280B	Tan	Mastic	None Detected
	Layer 2	B29280B	Gray	Leveling Compound	None Detected
	Layer 3	B29280B	Black	Mastic	None Detected
43D		B29281A	White	Floor Tile	None Detected
		B29281B	Black	Mastic	None Detected
56A	Layer 1	B29282	White	Joint Compound	None Detected
	Layer 2	B29282	Gray	Drywall	None Detected
56B		B29283	White	Joint Compound	None Detected
57A		B29284	White	Ceiling Texture	None Detected
57B		B29285	White	Ceiling Texture	None Detected
57C		B29286	White	Ceiling Texture	None Detected
58A		B29287	Gray	Ceiling Tile	None Detected
58B		B29288	Gray	Ceiling Tile	None Detected
59A		B29289	Gray	Ceiling Tile	None Detected
59B		B29290	Gray	Ceiling Tile	None Detected
60A		B29291	White	Ceiling Tile	None Detected
60B		B29292	White	Ceiling Tile	None Detected
61A		B29293A	White	Floor Tile	None Detected
		B29293B	Tan	Mastic	None Detected
61B		B29294A	White	Floor Tile	None Detected
		B29294B	Tan	Mastic	None Detected
62A		B29295A	Faux Wood	Sheet Flooring	None Detected
		B29295B	Tan	Mastic	None Detected
62B		B29296A	Faux Wood	Sheet Flooring	None Detected
		B29296B	Tan	Mastic	None Detected
63A	Layer 1	B29297	White	Joint Compound	None Detected
	Layer 2	B29297	Gray	Drywall	None Detected

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Waynesville Elementary, 18510214COLa **LAB CODE:** B191699

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
63B	Layer 1	B29298	White	Joint Compound	None Detected
	Layer 2	B29298	Gray	Drywall	None Detected
64A		B29299	Tan	Carpet Mastic	None Detected
64B		B29300	Tan	Carpet Mastic	None Detected
65A		B29301	Tan	Stucco	None Detected
65B		B29302	Tan	Stucco	None Detected
66A		B29303	Tan	Door Caulk	None Detected
66B		B29304	Tan	Door Caulk	None Detected
67A		B29305	Gray	Plaster	None Detected
67B		B29306	Gray	Plaster	None Detected
67C		B29307	Gray	Plaster	None Detected
68A		B29308	White	Joint Compound	None Detected
68B	Layer 1	B29309	White	Joint Compound	None Detected
	Layer 2	B29309	Gray	Drywall	None Detected
69A		B29310	Gray	Ceiling Tile	None Detected
69B		B29311	Gray	Ceiling Tile	None Detected
70A		B29312A	Blue	Floor Tile	None Detected
		B29312B	Tan	Mastic	None Detected
70B		B29313A	Blue	Floor Tile	None Detected
		B29313B	Tan	Mastic	None Detected
71A		B29314	White	Sink Undercoating	None Detected
71B		B29315	White	Sink Undercoating	None Detected
72A		B29316A	Brown	Ceiling Tile	None Detected
		B29316B	Brown	Mastic	Chrysotile 2%
72B		B29317A	Brown	Ceiling Tile	None Detected
		B29317B		Sample Not Analyzed per COC	
73A		B29318	Tan	Window Caulking	None Detected
73B		B29319	Tan	Window Caulking	None Detected
74A		B29320	Brown	Caulking	None Detected
74B		B29321	Brown	Caulking	None Detected
75A		B29322	Dark Grey	Caulking	None Detected

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Waynesville Elementary, 18510214COLa **LAB CODE:** B191699

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
75B		B29323	Dark Grey	Caulking	None Detected
76A		B29324	Black	Window Caulking	None Detected
76B		B29325	Black	Window Caulking	None Detected
77A		B29326	Light Gray	Concrete Caulk	None Detected
77B		B29327	Light Gray	Concrete Caulk	None Detected
78A		B29328	Tan	Caulking	None Detected
78B		B29329	Tan	Caulking	None Detected
79A		B29330	Gray	Seam Caulking	None Detected
79B		B29331	Gray	Seam Caulking	None Detected
80A		B29332	Gray,Tan	Window Caulking	None Detected
80B		B29333	Gray,Tan	Window Caulking	None Detected
81A		B29334	Beige	Window Caulking	None Detected
81B		B29335	Beige	Window Caulking	None Detected
82A		B29336	Black	Caulking	None Detected
82B		B29337	Black	Caulking	None Detected
83A		B29338	White	Door Caulk	Chrysotile 2%
83B		B29339		Sample Not Analyzed per COC	
84A		B29340	Black	Window Caulking	None Detected
84B		B29341	Black	Window Caulking	None Detected
85A		B29342	Tan	Window Caulking	None Detected
85B		B29343	Tan	Window Caulking	None Detected
86A		B29344	Beige	Concrete Caulk	None Detected
86B		B29345	Beige	Concrete Caulk	None Detected
87A		B29346	Brown	Window Caulking	None Detected
87B		B29347	Brown	Window Caulking	None Detected
88A		B29348A	White	Caulking	None Detected
		B29348B	Brown	Caulking	None Detected
88B		B29349A	White	Caulking	None Detected
		B29349B	Brown	Caulking	None Detected
89A		B29350	Gray	Concrete Seam Caulk	Chrysotile 5%
89B		B29351		Sample Not Analyzed per COC	

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: Waynesville Elementary, 18510214COLa **LAB CODE:** B191699

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
90A		B29352	Brown	Window Caulking	None Detected
90B		B29353	Brown	Window Caulking	None Detected
91A		B29354	White	Concrete Caulk	Chrysotile 3%
91B		B29355		Sample Not Analyzed per COC	
92A		B29356	Tan	Door Caulk	None Detected
92B		B29357	Tan	Door Caulk	None Detected
93A		B29358	Black	Window Caulking	None Detected
93B		B29359	Black	Window Caulking	None Detected
94A		B29360	Red	Window Caulking	None Detected
94B		B29361	Red	Window Caulking	None Detected
45C		B29362A	Gray	Floor Tile	None Detected
		B29362B	Black	Mastic	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous		ASBESTOS %
10D B29277	Plaster	Heterogeneous White Non-fibrous Bound		70% 20% 10%	Calc Carb Silicates Paint	None Detected
18F B29278	Plaster	Heterogeneous White Non-fibrous Bound		70% 20% 10%	Silicates Binder Paint	None Detected
18G B29279	Plaster	Heterogeneous White Non-fibrous Bound		70% 20% 10%	Silicates Binder Paint	None Detected
43C B29280A	Floor Tile	Heterogeneous White Non-fibrous Tightly Bound		100%	Vinyl	None Detected
Layer 1 B29280B	Mastic	Heterogeneous Tan Non-fibrous Bound		100%	Mastic	None Detected
Layer 2 B29280B	Leveling Compound	Heterogeneous Gray Non-fibrous Bound		65% 35%	Silicates Binder	None Detected
Layer 3 B29280B	Mastic	Heterogeneous Black Non-fibrous Bound		100% <1%	Mastic Silicates	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
43D B29281A	Floor Tile	Heterogeneous White Non-fibrous Tightly Bound			100%	Vinyl	None Detected
B29281B	Mastic	Heterogeneous Black Non-fibrous Bound			100%	Mastic	None Detected
56A Layer 1 B29282	Joint Compound	Heterogeneous White Non-fibrous Tightly Bound			75% 25%	Calc Carb Binder	None Detected
Layer 2 B29282	Drywall	Heterogeneous Gray Fibrous Bound	25%	Cellulose	75%	Gypsum	None Detected
56B B29283	Joint Compound	Heterogeneous White Non-fibrous Tightly Bound			75% 25%	Calc Carb Binder	None Detected
Lab Notes: Drywall is not present.							
57A B29284	Ceiling Texture	Heterogeneous White Non-fibrous Bound			75% 20% 5%	Calc Carb Binder Paint	None Detected
57B B29285	Ceiling Texture	Heterogeneous White Non-fibrous Bound			75% 20% 5%	Calc Carb Binder Paint	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
57C B29286	Ceiling Texture	Heterogeneous White Non-fibrous Bound			75% 20% 5%	Calc Carb Binder Paint	None Detected
58A B29287	Ceiling Tile	Heterogeneous Gray Fibrous Bound	50% 10%	Cellulose Fiberglass	35% 5%	Perlite Paint	None Detected
58B B29288	Ceiling Tile	Heterogeneous Gray Fibrous Bound	50% 10%	Cellulose Fiberglass	35% 5%	Perlite Paint	None Detected
59A B29289	Ceiling Tile	Heterogeneous Gray Fibrous Bound	50% 10%	Cellulose Fiberglass	35% 5%	Perlite Paint	None Detected
59B B29290	Ceiling Tile	Heterogeneous Gray Fibrous Bound	50% 10%	Cellulose Fiberglass	35% 5%	Perlite Paint	None Detected
60A B29291	Ceiling Tile	Heterogeneous White Fibrous Bound	80%	Fiberglass	15% 5%	Binder Paint	None Detected
60B B29292	Ceiling Tile	Heterogeneous White Fibrous Bound	80%	Fiberglass	15% 5%	Binder Paint	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
61A B29293A	Floor Tile	Heterogeneous White Non-fibrous Tightly Bound			100%	Vinyl	None Detected
B29293B	Mastic	Heterogeneous Tan Non-fibrous Bound			100%	Mastic	None Detected
61B B29294A	Floor Tile	Heterogeneous White Non-fibrous Tightly Bound			100%	Vinyl	None Detected
B29294B	Mastic	Heterogeneous Tan Non-fibrous Bound			100%	Mastic	None Detected
62A B29295A	Sheet Flooring	Heterogeneous Faux Wood Fibrous Bound	20%	Cellulose	75% 5%	Vinyl Binder	None Detected
B29295B	Mastic	Heterogeneous Tan Non-fibrous Bound			100%	Mastic	None Detected
62B B29296A	Sheet Flooring	Heterogeneous Faux Wood Fibrous Bound	20%	Cellulose	75% 5%	Vinyl Binder	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
B29296B	Mastic	Heterogeneous Tan Non-fibrous Bound			100%	Mastic	None Detected
63A Layer 1 B29297	Joint Compound	Heterogeneous White Non-fibrous Tightly Bound			75% 25%	Calc Carb Binder	None Detected
Layer 2 B29297	Drywall	Heterogeneous Gray Fibrous Bound	25%	Cellulose	75%	Gypsum	None Detected
63B Layer 1 B29298	Joint Compound	Heterogeneous White Non-fibrous Tightly Bound			75% 25%	Calc Carb Binder	None Detected
Layer 2 B29298	Drywall	Heterogeneous Gray Fibrous Bound	25%	Cellulose	75%	Gypsum	None Detected
64A B29299	Carpet Mastic	Heterogeneous Tan Non-fibrous Bound			85% 15%	Mastic Binder	None Detected
64B B29300	Carpet Mastic	Heterogeneous Tan Non-fibrous Bound			85% 15%	Mastic Binder	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
65A B29301	Stucco	Heterogeneous Tan Fibrous Bound	5%	Fiberglass	75% 15% 5%	Silicates Binder Paint	None Detected
65B B29302	Stucco	Heterogeneous Tan Fibrous Bound	5%	Fiberglass	75% 15% 5%	Silicates Binder Paint	None Detected
66A B29303	Door Caulk	Heterogeneous Tan Non-fibrous Bound			100%	Caulk	None Detected
66B B29304	Door Caulk	Heterogeneous Tan Non-fibrous Bound			100%	Caulk	None Detected
67A B29305	Plaster	Heterogeneous Gray Non-fibrous Bound			70% 20% 10%	Silicates Binder Paint	None Detected
67B B29306	Plaster	Heterogeneous Gray Non-fibrous Bound			70% 20% 10%	Silicates Binder Paint	None Detected
67C B29307	Plaster	Heterogeneous Gray Non-fibrous Bound			70% 20% 10%	Silicates Binder Paint	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
68A B29308	Joint Compound	Heterogeneous White Non-fibrous Tightly Bound			75% 25%	Calc Carb Binder	None Detected
Lab Notes: Drywall is not present							
68B Layer 1 B29309	Joint Compound	Heterogeneous White Non-fibrous Tightly Bound			75% 25%	Calc Carb Binder	None Detected
Layer 2 B29309	Drywall	Heterogeneous Gray Fibrous Bound	25%	Cellulose	75%	Gypsum	None Detected
69A B29310	Ceiling Tile	Heterogeneous Gray Fibrous Bound	55% 10%	Cellulose Fiberglass	35% <1%	Perlite Paint	None Detected
69B B29311	Ceiling Tile	Heterogeneous Gray Fibrous Bound	55% 10%	Cellulose Fiberglass	35% <1%	Perlite Paint	None Detected
70A B29312A	Floor Tile	Heterogeneous Blue Non-fibrous Tightly Bound			100%	Vinyl	None Detected
B29312B	Mastic	Heterogeneous Tan Non-fibrous Bound			100%	Mastic	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
70B B29313A	Floor Tile	Heterogeneous Blue Non-fibrous Tightly Bound			100%	Vinyl	None Detected
B29313B	Mastic	Heterogeneous Tan Non-fibrous Bound			100%	Mastic	None Detected
71A B29314	Sink Undercoating	Heterogeneous White Fibrous Loose	35%	Cellulose	65%	Binder	None Detected
71B B29315	Sink Undercoating	Heterogeneous White Fibrous Loose	35%	Cellulose	65%	Binder	None Detected
72A B29316A	Ceiling Tile	Heterogeneous Brown Fibrous Loose	100%	Cellulose			None Detected
B29316B	Mastic	Heterogeneous Brown Non-fibrous Bound			98%	Mastic	**2% Chrysotile**
72B B29317A	Ceiling Tile	Heterogeneous Brown Fibrous Loose	100%	Cellulose			None Detected
B29317B	Sample Not Analyzed per COC						

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous	ASBESTOS %
73A B29318	Window Caulking	Homogeneous Tan Non-fibrous Bound		100% Caulk	None Detected
73B B29319	Window Caulking	Homogeneous Tan Non-fibrous Bound		100% Caulk	None Detected
74A B29320	Caulking	Homogeneous Brown Non-fibrous Bound		100% Caulk	None Detected
74B B29321	Caulking	Homogeneous Brown Non-fibrous Bound		100% Caulk	None Detected
75A B29322	Caulking	Homogeneous Dark Grey Non-fibrous Bound		100% Caulk	None Detected
75B B29323	Caulking	Homogeneous Dark Grey Non-fibrous Bound		100% Caulk	None Detected
76A B29324	Window Caulking	Homogeneous Black Non-fibrous Bound		100% Caulk	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous	ASBESTOS %
76B B29325	Window Caulking	Homogeneous Black Non-fibrous Bound	100%	Caulk	None Detected
77A B29326	Concrete Caulk	Homogeneous Light Gray Non-fibrous Bound	100%	Caulk	None Detected
77B B29327	Concrete Caulk	Homogeneous Light Gray Non-fibrous Bound	100%	Caulk	None Detected
78A B29328	Caulking	Homogeneous Tan Non-fibrous Bound	100%	Caulk	None Detected
78B B29329	Caulking	Homogeneous Tan Non-fibrous Bound	100%	Caulk	None Detected
79A B29330	Seam Caulking	Homogeneous Gray Non-fibrous Bound	100%	Caulk	None Detected
79B B29331	Seam Caulking	Homogeneous Gray Non-fibrous Bound	100%	Caulk	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous		ASBESTOS %
80A B29332	Window Caulking	Homogeneous Gray,Tan Non-fibrous Bound		100%	Caulk	None Detected
80B B29333	Window Caulking	Homogeneous Gray,Tan Non-fibrous Bound		100%	Caulk	None Detected
81A B29334	Window Caulking	Homogeneous Beige Non-fibrous Bound		100%	Caulk	None Detected
81B B29335	Window Caulking	Homogeneous Beige Non-fibrous Bound		100%	Caulk	None Detected
82A B29336	Caulking	Homogeneous Black Non-fibrous Bound		100%	Caulk	None Detected
82B B29337	Caulking	Homogeneous Black Non-fibrous Bound		100%	Caulk	None Detected
83A B29338	Door Caulk	Heterogeneous White Fibrous Bound		98%	Caulk	**2% Chrysotile**
83B B29339	Sample Not Analyzed per COC					

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous	ASBESTOS %
84A B29340	Window Caulking	Homogeneous Black Non-fibrous Bound		100% Caulk	None Detected
84B B29341	Window Caulking	Homogeneous Black Non-fibrous Bound		100% Caulk	None Detected
85A B29342	Window Caulking	Homogeneous Tan Non-fibrous Bound		100% Caulk	None Detected
85B B29343	Window Caulking	Homogeneous Tan Non-fibrous Bound		100% Caulk	None Detected
86A B29344	Concrete Caulk	Homogeneous Beige Non-fibrous Bound		100% Caulk	None Detected
86B B29345	Concrete Caulk	Homogeneous Beige Non-fibrous Bound		100% Caulk	None Detected
87A B29346	Window Caulking	Homogeneous Brown Non-fibrous Bound		100% Caulk	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous		ASBESTOS %
87B B29347	Window Caulking	Homogeneous Brown Non-fibrous Bound		100%	Caulk	None Detected
88A B29348A	Caulking	Homogeneous White Non-fibrous Bound		100%	Caulk	None Detected
B29348B	Caulking	Homogeneous Brown Non-fibrous Bound		100%	Caulk	None Detected
88B B29349A	Caulking	Homogeneous White Non-fibrous Bound		100%	Caulk	None Detected
B29349B	Caulking	Homogeneous Brown Non-fibrous Bound		100%	Caulk	None Detected
89A B29350	Concrete Seam Caulk	Heterogeneous Gray Fibrous Bound		95%	Caulk	**5% Chrysotile**
89B B29351	Sample Not Analyzed per COC					
90A B29352	Window Caulking	Homogeneous Brown Non-fibrous Bound		100%	Caulk	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
90B B29353	Window Caulking	Homogeneous Brown Non-fibrous Bound			100%	Caulk	None Detected
91A B29354	Concrete Caulk	Heterogeneous White Fibrous Bound	15%	Talc	82%	Caulk	**3% Chrysotile**
91B B29355	Sample Not Analyzed per COC						
92A B29356	Door Caulk	Homogeneous Tan Non-fibrous Bound			100%	Caulk	None Detected
92B B29357	Door Caulk	Homogeneous Tan Non-fibrous Bound			100%	Caulk	None Detected
93A B29358	Window Caulking	Homogeneous Black Non-fibrous Bound			100%	Caulk	None Detected
93B B29359	Window Caulking	Homogeneous Black Non-fibrous Bound			100%	Caulk	None Detected
94A B29360	Window Caulking	Homogeneous Red Non-fibrous Bound			100%	Caulk	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: CTL Engineering, Inc
2860 Fisher Road
Columbus, OH 43204

Lab Code: B191699
Date Received: 03-22-19
Date Analyzed: 04-05-19
Date Reported: 04-05-19

Project: Waynesville Elementary, 18510214COLa

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous		ASBESTOS %
94B B29361	Window Caulking	Homogeneous Red Non-fibrous Bound		100%	Caulk	None Detected
45C B29362A	Floor Tile	Heterogeneous Gray Non-fibrous Tightly Bound		100%	Vinyl	None Detected
B29362B	Mastic	Homogeneous Black Non-fibrous Bound		100%	Mastic	None Detected

eurofins | CEI

LEGEND: Non-Anth = Non-Asbestiform Anthophyllite
Non-Trem = Non-Asbestiform Tremolite
Calc Carb = Calcium Carbonate

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

REPORTING LIMIT: <1% by visual estimation

REPORTING LIMIT FOR POINT COUNTS: 0.25% by 400 Points or 0.1% by 1,000 Points

REGULATORY LIMIT: >1% by weight

Due to the limitations of the EPA 600 method, nonfriable organically bound materials (NOBs) such as vinyl floor tiles can be difficult to analyze via polarized light microscopy (PLM). EPA recommends that all NOBs analyzed by PLM, and found not to contain asbestos, be further analyzed by Transmission Electron Microscopy (TEM). Please note that PLM analysis of dust and soil samples for asbestos is not covered under NVLAP accreditation. *Estimated measurement of uncertainty is available on request.*

This report relates only to the samples tested or analyzed and may not be reproduced, except in full, without written approval by Eurofins CEI. Eurofins CEI makes no warranty representation regarding the accuracy of client submitted information in preparing and presenting analytical results. Interpretation of the analytical results is the sole responsibility of the client. Samples were received in acceptable condition unless otherwise noted. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Information provided by customer includes customer sample ID, location, volume and area as well as date and time of sampling.

ANALYST: Yvette Nkunde-Bose

APPROVED BY: Tianbao Bai, Ph.D., CIH
Laboratory Director

NVLAP TESTING
NVLAP LAB CODE 101768-0

eurofins | CEI

CHAIN OF CUSTODY

(46)

730 SE Maynard Road, Cary, NC 27511
Tel: 866-481-1412; Fax: 919-481-1442

LAB USE ONLY:	
CEI Lab Code:	B191699
CEI Lab I.D. Range:	B29277 - B29362

COMPANY INFORMATION		PROJECT INFORMATION	
CEI CLIENT #:		Job Contact:	Chris Rittenhouse
Company:	CTL Engineering INC	Email / Tel:	crittenhouse@CTLeng.com
Address:	2860 Fisher Rd	Project Name:	Waynesville Elementary
	Columbus, OH 43204	Project ID#:	185102.14COLa
Email:	Kboyer@CTLeng.com	PO #:	42539
Tel:	614-824-3554 Fax:	STATE SAMPLES COLLECTED IN:	

IF TAT IS NOT MARKED STANDARD 3 DAY TAT APPLIES.

ASBESTOS	METHOD	TURN AROUND TIME					
		4 HR	8 HR	1 DAY	2 DAY	3 DAY	5 DAY
PLM BULK	EPA 600	☐	☐	☐	☐	☒	☐
PLM POINT COUNT (400)	EPA 600	☐	☐	☐	☐	☐	☐
PLM POINT COUNT (1000)	EPA 600	☐	☐	☐	☐	☐	☐
PLM GRAV w POINT COUNT	EPA 600		☐	☐	☐	☐	☐
PLM BULK	CARB 435		☐	☐	☐	☐	☐
PCM AIR	NIOSH 7400	☐	☐	☐	☐	☐	☐
TEM AIR	EPA AHERA	☐	☐	☐	☐	☐	☐
TEM AIR	NIOSH 7402	☐	☐	☐	☐	☐	☐
TEM AIR (PCME)	ISO 10312	☐	☐	☐	☐	☐	☐
TEM AIR	ASTM 6281-15	☐	☐	☐	☐	☐	☐
TEM BULK	CHATFIELD		☐	☐	☐	☐	☐
TEM DUST WIPE	ASTM D6480-05 (2010)	☐	☐	☐	☐	☐	☐
TEM DUST MICROVAC	ASTM D5755-09 (2014)	☐	☐	☐	☐	☐	☐
TEM SOIL	ASTM D7521-16			☐	☐	☐	☐
TEM VERMICULITE	CINCINNATI METHOD			☐	☐	☐	☐
TEM QUALITTATIVE	IN-HOUSE METHOD		☐	☐	☐	☐	☐
OTHER:		☐	☐	☐	☐	☐	☐

REMARKS / SPECIAL INSTRUCTIONS:
* Positive Stop 10 day TAT - ok 3/22

☒ Accept Samples
☐ Reject Samples

Relinquished By:	Date/Time	Received By:	Date/Time
Kurt Boyer	3/21/19 5:00 Pm	KC	3/22/19 9:40am

Samples will be disposed of 30 days after analysis

eurofins | CEI

SAMPLING FORM

B191699

COMPANY CONTACT INFORMATION			
Company:	CTL Engineering	Job Contact:	Chris Rittenhouse
Project Name:	Waynesville Elementary		
Project ID #:	185102.14 COLa	Tel:	614-824-3554

SAMPLE ID#	DESCRIPTION / LOCATION	VOLUME/ AREA	TEST	
10 D	Hard Plaster II		PLM ☐	TEM ☐
18F-18G	Hard Plaster Ceiling		PLM ☐	TEM ☐
43 C/D	12" White w/gray specks		PLM ☐	TEM ☐
56A-56B	DW/JC-Central office		PLM ☐	TEM ☐
57A-57C	Ceiling Texture Central office		PLM ☐	TEM ☐
58A-58B	Ceiling tile Pinhole Central		PLM ☐	TEM ☐
59A-59B	CT Wormhole Central office		PLM ☐	TEM ☐
60A-60B	CT Smooth Central office		PLM ☐	TEM ☐
61A-61B	12" White w/line Streak FT		PLM ☐	TEM ☐
62A-62B	Faux Wood Vinyl SF		PLM ☐	TEM ☐
63A-63B	DW/JC II		PLM ☐	TEM ☐
64A-64B	Carpet mastic Central office		PLM ☐	TEM ☐
65A-65B	Stucco Central office		PLM ☐	TEM ☐
66A-66B	Off-white door caulk CO		PLM ☐	TEM ☐
67A-67C	Hard Plaster Ceiling		PLM ☐	TEM ☐
68A-68B	DW/JC 2000		PLM ☐	TEM ☐
69A-69B	2X2 CT bird track 2000		PLM ☐	TEM ☐
70A-70B	12" Lt Blue FT		PLM ☐	TEM ☐
71A-71B	Black Sink Undercoating		PLM ☐	TEM ☐
72A-72B	1" CT w/Brown mastic 1952		PLM ☐	TEM ☐
73A-73B	Tan & Brown Window caulk		PLM ☐	TEM ☐
74A-74B	Dark Brown & Lt Brown Caulk		PLM ☐	TEM ☐
75A-75B	Light & Dark Grey Concrete Caulk		PLM ☐	TEM ☐
76A-76B	Grey & Black window caulk		PLM ☐	TEM ☐
77A-77B	Light Grey Patching Concrete caulk		PLM ☐	TEM ☐
78A-78B	Exterior cafeteria tan caulk		PLM ☐	TEM ☐
79A-79B	Concrete Seam Caulk FT		PLM ☐	TEM ☐
80A-80B	Tan/Grey window caulk		PLM ☐	TEM ☐

B191699

eurofins | CEI

SAMPLING FORM

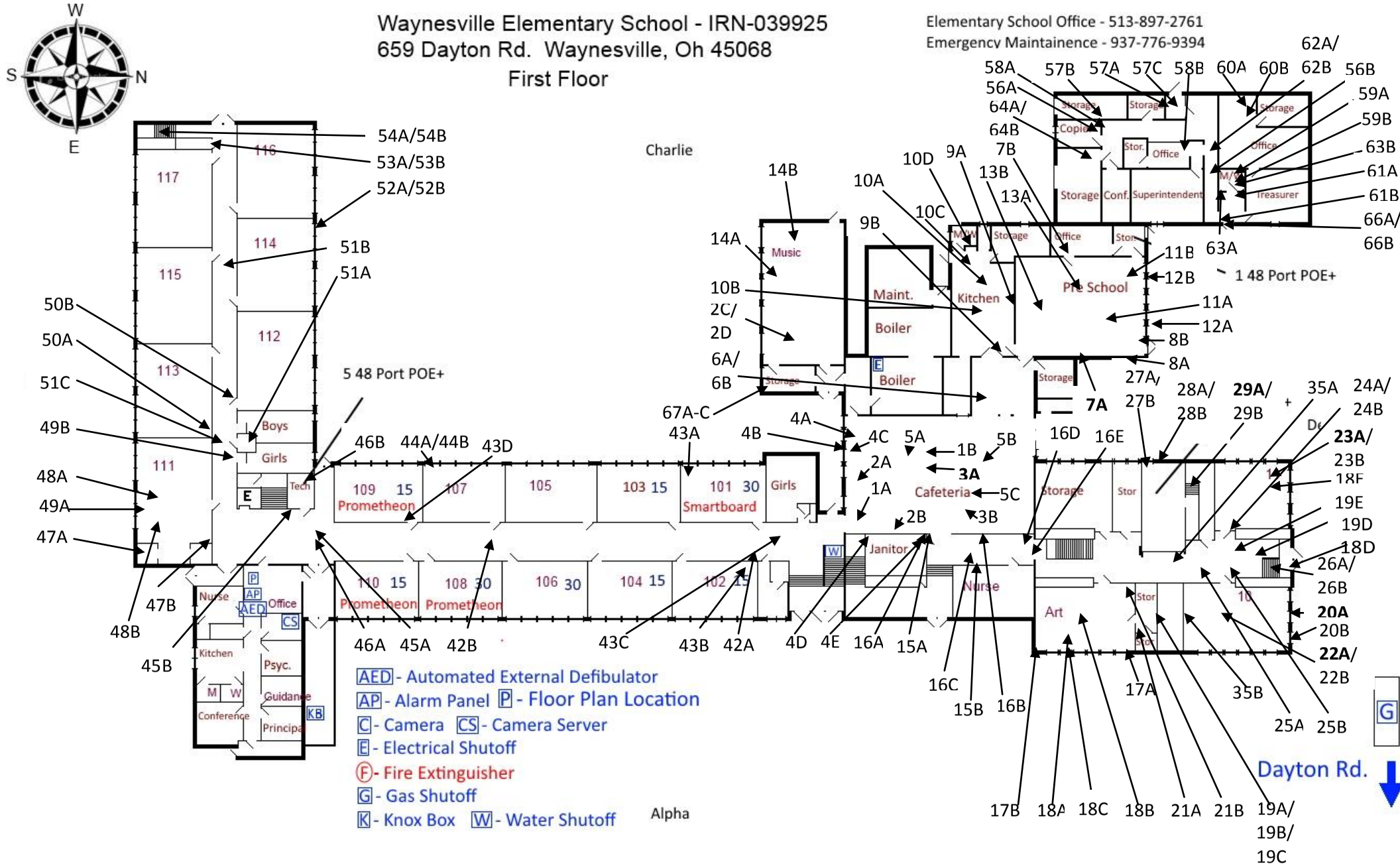
COMPANY CONTACT INFORMATION			
Company:	CTL Engineering	Job Contact:	Chris Rittenhouse
Project Name:	Waynesville Elementary		
Project ID #:	185102140LA	Tel:	614-824-3554

SAMPLE ID#	DESCRIPTION / LOCATION	VOLUME/ AREA	TEST	
81A-81B	Beige window Caulk		PLM ☐	TEM ☐
82A-82B	Black Caulk		PLM ☐	TEM ☐
83A-83B	Weathered White Door Caulk		PLM ☐	TEM ☐
84A-84B	Weathered black window Caulk		PLM ☐	TEM ☐
85A-85B	Weathered Tan window Caulk		PLM ☐	TEM ☐
86A-86B	Weathered Beige Concrete caulk		PLM ☐	TEM ☐
87A-87B	Preschool Weathered window Caulk		PLM ☐	TEM ☐
88A-88B	Weathered white & black Door Caulk		PLM ☐	TEM ☐
89A-89B	Concrete Seam Caulk		PLM ☐	TEM ☐
90A-90B	Park Brown window Caulk		PLM ☐	TEM ☐
91A-91B	Weathered white Concrete caulk		PLM ☐	TEM ☐
92A-92B	tan Door Caulk		PLM ☐	TEM ☐
93A-93B	Black window Caulk		PLM ☐	TEM ☐
94A-94B	Red window caulk		PLM ☐	TEM ☐
45C			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐
			PLM ☐	TEM ☐

APPENDIX D

Sample Location Plans

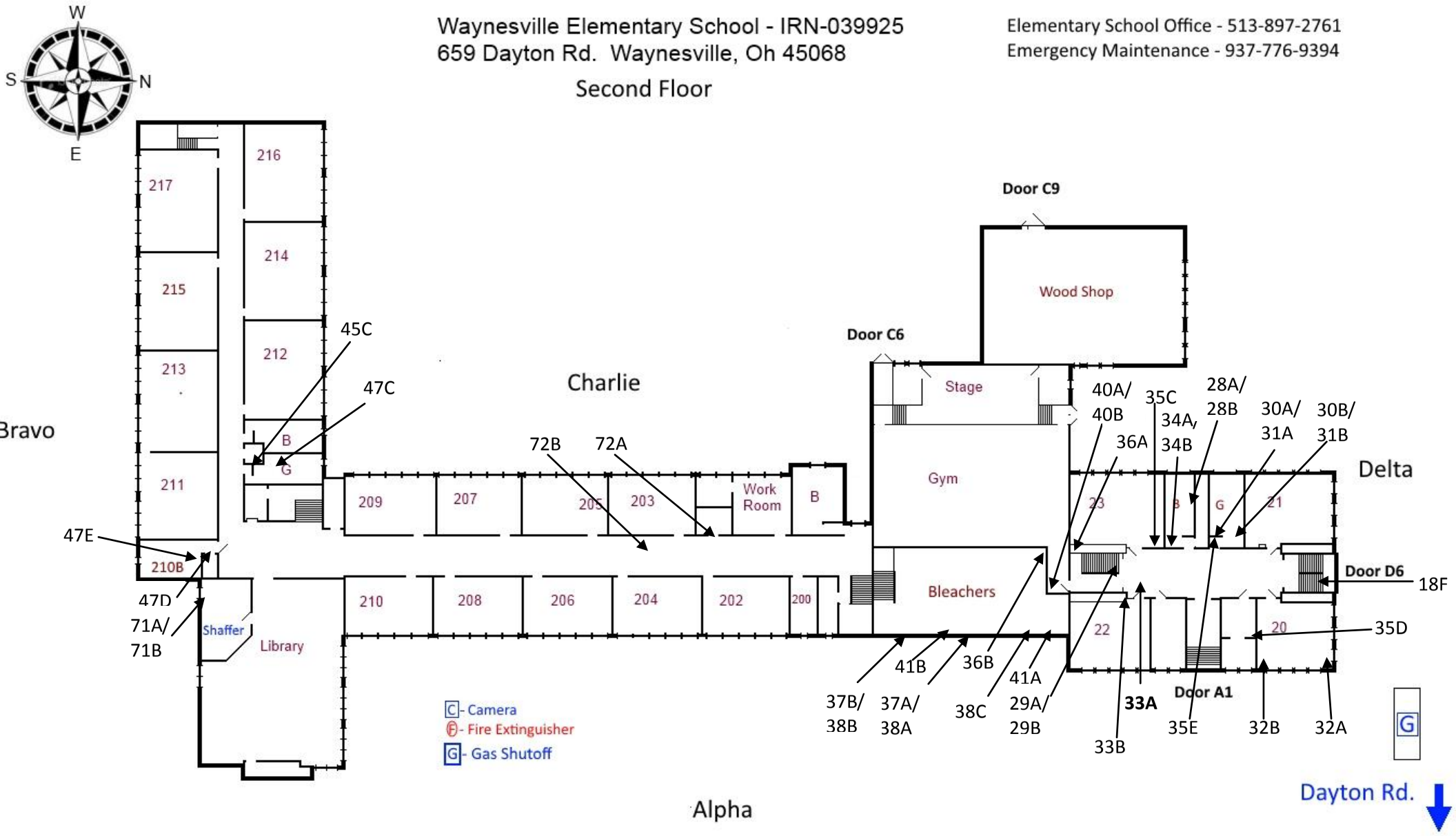
Additional Documents


Waynesville Elementary School - IRN-039925
659 Dayton Rd. Waynesville, Oh 45068
First Floor
Elementary School Office - 513-897-2761
Emergency Maintainence - 937-776-9394
W
S
N
E
Charlie
Alpha
5 48 Port POE+
1 48 Port POE+
Music
Maint.
Boiler
Kitchen
Pre School
Boys
Girls
Tech
Prometheon
Smartboard
Janitor
Nurse
Office
Cafeteria
Art
Storage
Conf.
Superintendent
Treasurer
Copier
Psyc.
Guidance
Conference
Principal
Dayton Rd.
AED - Automated External Defibulator
AP - Alarm Panel P - Floor Plan Location
C - Camera CS - Camera Server
E - Electrical Shutoff
F - Fire Extinguisher
G - Gas Shutoff
K - Knox Box W - Water Shutoff

Waynesville Elementary School - IRN-039925
659 Dayton Rd. Waynesville, Oh 45068

Second Floor

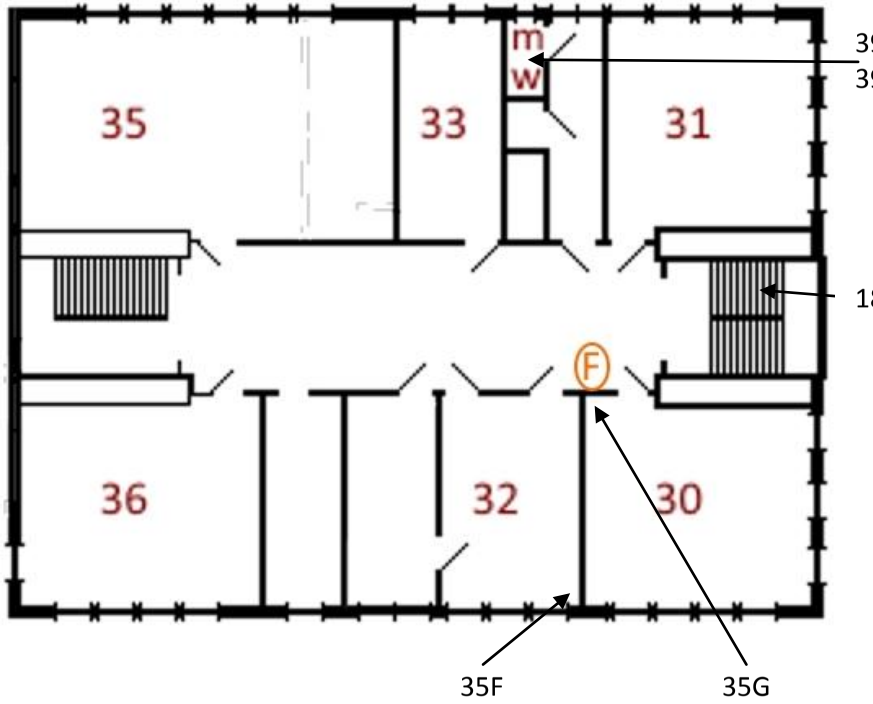
Elementary School Office - 513-897-2761
Emergency Maintenance - 937-776-9394



Waynesville Elementary School - Third Floor
659 Dayton Rd. IRN - 039925
Waynesville, Ohio 45068
Office - 513-897-2761
Emergency Maintainence - 937-776-9394

Charlie

Dayton Rd. Entrance



Bravo

Delta

F Fire Extinguisher
G Gas Shutoff

Alpha

G

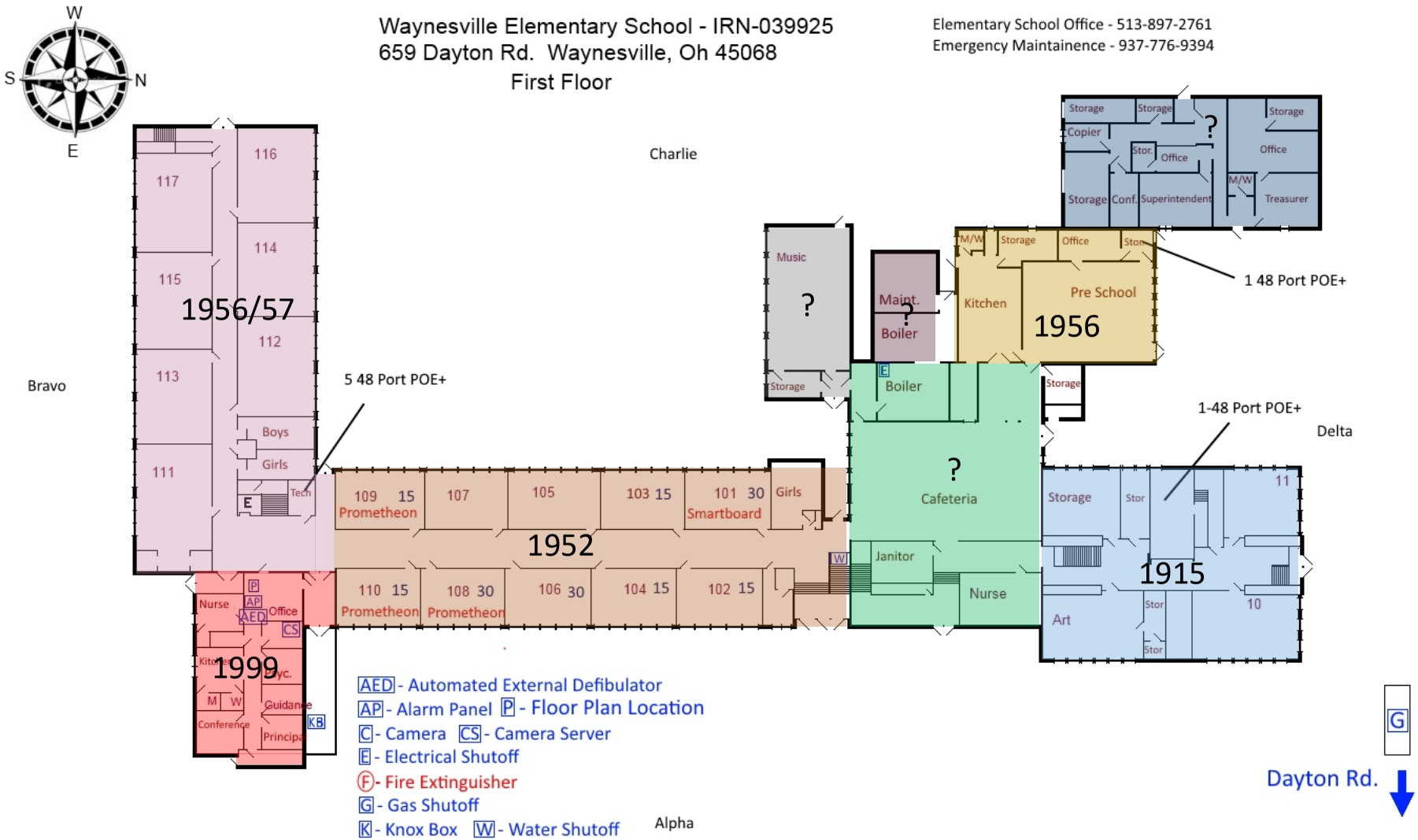
Waynesville Elementary School - IRN-039925

659 Dayton Rd. Waynesville, Oh 45068

First Floor

Elementary School Office - 513-897-2761

Emergency Maintainence - 937-776-9394



AED - Automated External Defibulator

AP - Alarm Panel P - Floor Plan Location

C - Camera CS - Camera Server

E - Electrical Shutoff

F - Fire Extinguisher

G - Gas Shutoff

K - Knox Box W - Water Shutoff

MONDAY

TESI

WAYNESVILLE ELEMENTARY

659 DAYTON RD., WAYNESVILLE, OH 45068

FP-2

THIRD FLOOR

PLASTER WALLS & CEILINGS
THIS MATERIAL IS LOCATED ON THE WALLS AND CEILINGS OF THE THIRD FLOOR IN BOTH THE HALLWAYS AND ROOMS. BOTH THE FINISH COAT AND BASE COAT CONTAIN ASBESTOS.

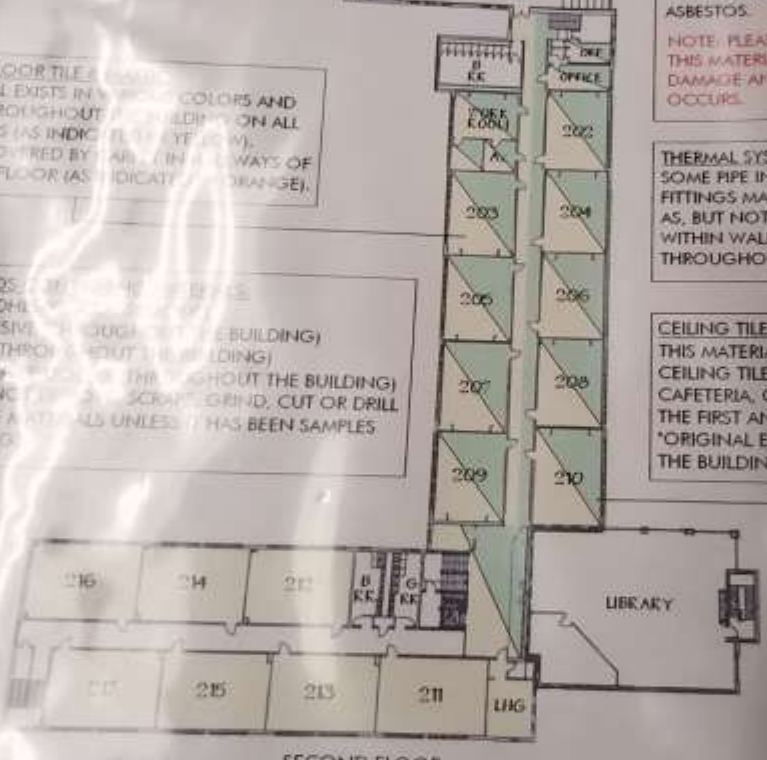
NOTE: PLEASE DO NOT CUT OR DRILL INTO THIS MATERIAL. WATCH CLOSELY FOR DAMAGE AND REPAIR IMMEDIATELY IF OCCURS.

9" VAT FLOOR TILE
MATERIAL EXISTS IN COLORS AND PATTERNS THROUGHOUT ON ALL FLOORS (AS INDICATED BY YELLOW). IT IS COVERED BY CARPET IN HALLWAYS OF SECOND FLOOR (AS INDICATED BY ORANGE).

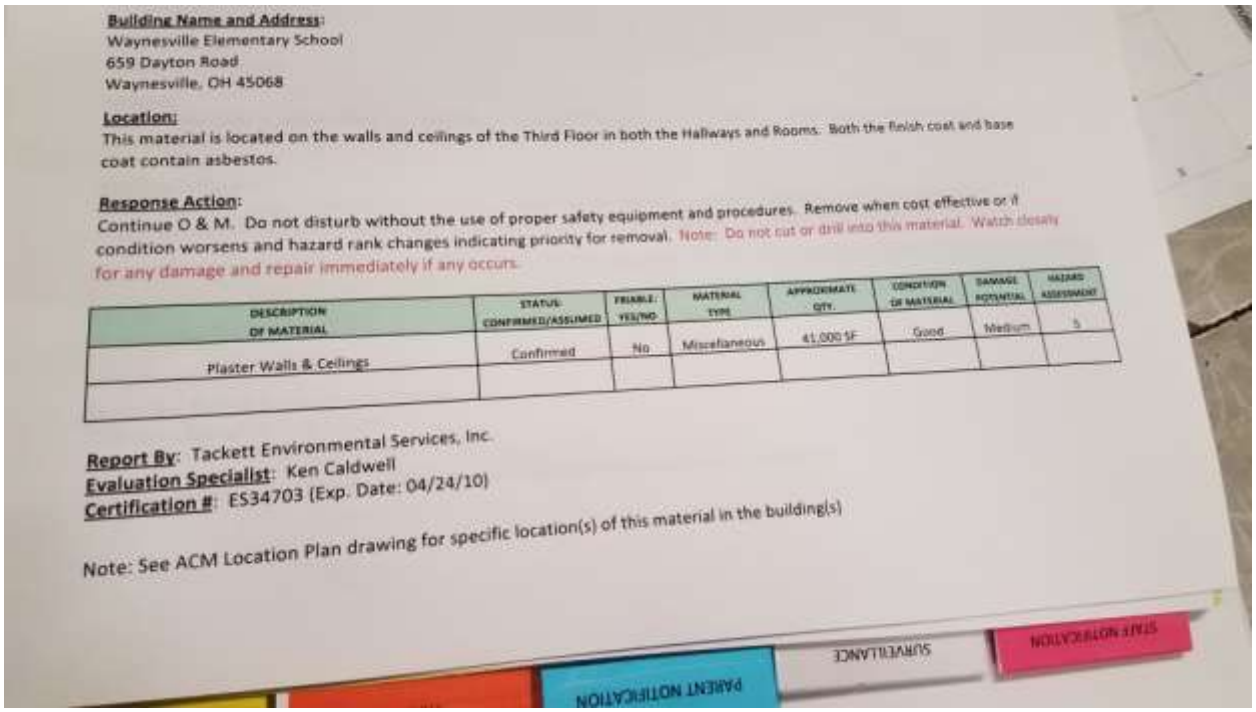
ASBESTOS
BOARD ADHESIVE THROUGHOUT THE BUILDING)
ASE ADHESIVE THROUGHOUT THE BUILDING)
ATINGS (THROUGHOUT THE BUILDING)
ORE AND THROUGHOUT THE BUILDING)
AGE DO NOT SCRAPE, GRIND, CUT OR DRILL
OF THESE MATERIALS UNLESS IT HAS BEEN SAMPLES
DISTURBING

THERMAL SYSTEM INSULATION (TSI)
SOME PIPE INSULATION AND/OR MUD FITTINGS MAY BE CONCEALED IN AREAS SUCH AS, BUT NOT LIMITED TO ABOVE CEILINGS, WITHIN WALLS, IN FLOORS AND CHASES THROUGHOUT THE BUILDING.

CEILING TILE ADHESIVE
THIS MATERIAL EXISTS ABOVE THE 1'X1' CEILING TILE IN THE CLASSROOMS, CAFETERIA, OFFICES AND HALLWAYS OF THE FIRST AND SECOND FLOORS OF THE "ORIGINAL ELEMENTARY" PORTION OF THE BUILDING (AS INDICATED IN GREEN).



SECOND FLOOR



Building Name and Address:
Waynesville Elementary School
659 Dayton Road
Waynesville, OH 45068

Location:
This material is located on the walls and ceilings of the Third Floor in both the Hallways and Rooms. Both the finish coat and base coat contain asbestos.

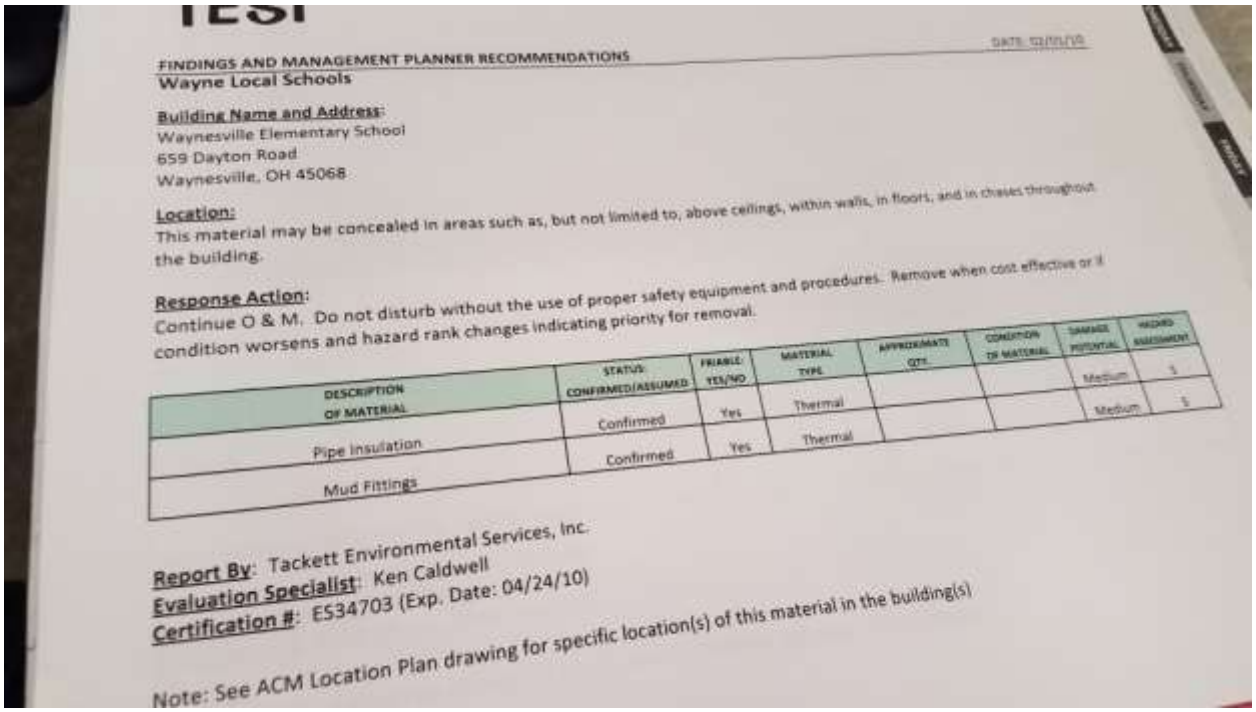
Response Action:
Continue O & M. Do not disturb without the use of proper safety equipment and procedures. Remove when cost effective or if condition worsens and hazard rank changes indicating priority for removal. Note: Do not cut or drill into this material. Watch closely for any damage and repair immediately if any occurs.

DESCRIPTION OF MATERIAL	STATUS CONFIRMED/ASSUMED	FRIABLE YES/NO	MATERIAL TYPE	APPROXIMATE QTY.	CONDITION OF MATERIAL	DAMAGE POTENTIAL	HAZARD ASSESSMENT
Plaster Walls & Ceilings	Confirmed	No	Miscellaneous	41,000 SF	Good	Medium	5

Report By: Tackett Environmental Services, Inc.
Evaluation Specialist: Ken Caldwell
Certification #: ES34703 (Exp. Date: 04/24/10)

Note: See ACM Location Plan drawing for specific location(s) of this material in the building(s)

PARENT NOTIFICATION
SURVEILLANCE
STAFF NOTIFICATION



FINDINGS AND MANAGEMENT PLANNER RECOMMENDATIONS

DATE: 02/05/10

Wayne Local Schools

Building Name and Address:
Waynesville Elementary School
659 Dayton Road
Waynesville, OH 45068

Location:
This material may be concealed in areas such as, but not limited to, above ceilings, within walls, in floors, and in chases throughout the building.

Response Action:
Continue O & M. Do not disturb without the use of proper safety equipment and procedures. Remove when cost effective or if condition worsens and hazard rank changes indicating priority for removal.

DESCRIPTION OF MATERIAL	STATUS CONFIRMED/ASSUMED	FRIABLE YES/NO	MATERIAL TYPE	APPROXIMATE QTY	CONDITION OF MATERIAL	DAMAGE POTENTIAL	HAZARD ASSESSMENT
Pipe Insulation	Confirmed	Yes	Thermal			Medium	5
Mud Fittings	Confirmed	Yes	Thermal			Medium	5

Report By: Tackett Environmental Services, Inc.
Evaluation Specialist: Ken Caldwell
Certification #: ES34703 (Exp. Date: 04/24/10)

Note: See ACM Location Plan drawing for specific location(s) of this material in the building(s)

APPENDIX E

Asbestos Certifications

Ohio Environmental Protection Agency

Mike DeWine, Governor
Jon Husted, Lt. Governor
Laurie A. Stevenson, Director

March 13, 2019

Christopher R Rittenhouse
2304 Kiowa Ct
Piqua OH 45356

RE: Asbestos Hazard Evaluation Specialist
Certification Number: ES35305
Expiration Date: 04/05/2020

Dear Christopher R Rittenhouse:

This letter and enclosed certification card approves your request to be certified as an Asbestos Hazard Evaluation Specialist. You must present your card upon request at any project site while performing duties. Copies of cards are not acceptable as proof of certification.

This certification may be revoked by the Director of the Environmental Protection Agency for violation of any of the requirements of 3745-22 or 3745-20 of the Ohio Administrative Code.

If you have any questions, please call 614-644-0226.

Sincerely,

Joshua S. Koch
Manager, Business Operations Support Section
Division of Air Pollution Control


State of Ohio
Environmental Protection Agency
Asbestos Program

Asbestos Hazard Evaluation Specialist

Christopher R Rittenhouse
2304 Kiowa Ct
Piqua OH 45356

DOB: 11/14/1983

Certification Number
ES35305

Expiration Date
04/05/2020

This certification is issued pursuant to Revised Code Chapter 3710 and Administrative Code Chapter 3745-22.

This card is not valid if altered.

P.O. Box 1049 • Columbus, OH 43216-1049
4-3020 • (614) 644-3184 (fax)

Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

October 09, 2018

Kurt Boyer
1097 Sea Shell Dr
Westerville OH 43082

RE: Asbestos Hazard Evaluation Specialist
Certification Number: ES36361
Expiration Date: 10/09/2019

Dear Kurt Boyer:

This letter and enclosed certification card approves your request to be certified as an Asbestos Hazard Evaluation Specialist. You must present your card upon request at any project site while performing duties. Copies of cards are not acceptable as proof of certification.

This certification may be revoked by the Director of the Environmental Protection Agency for violation of any of the requirements of 3745-22 or 3745-20 of the Ohio Administrative Code.

If you have any questions, please call 614-644-0226.

Sincerely,

Mark JS Needham

Mark Needham
Manager, Asbestos Program
Division of Air Pollution Control


State of Ohio
Environmental Protection Agency
Asbestos Program

Asbestos Hazard Evaluation Specialist

Kurt Boyer
1097 Sea Shell Dr
Westerville OH 43082

DOB: 10/14/1991

Certification Number
ES36361

Expiration Date
10/09/2019

This certification is issued pursuant to Revised Code Chapter 3710 and Administrative Code Chapter 3745-22.

This card is not valid if altered.

Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

September 05, 2018

Matthew W McClelland
CTL Engineering
2860 Fisher Road
Columbus OH 43204

RE: Asbestos Hazard Evaluation Specialist
Certification Number: ES34598
Expiration Date: 09/16/2019

Dear Matthew W McClelland:

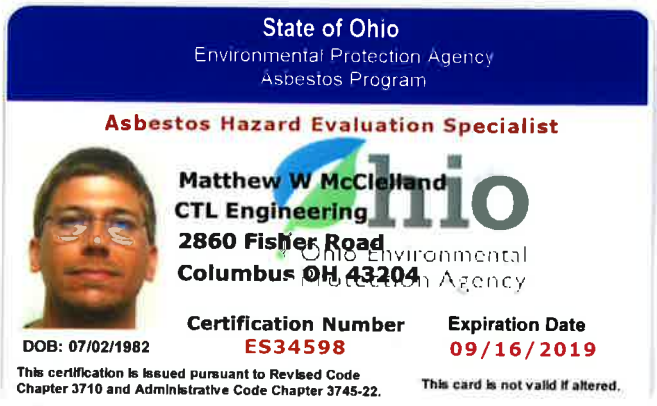
This letter and enclosed certification card approves your request to be certified as an Asbestos Hazard Evaluation Specialist. You must present your card upon request at any project site while performing duties. Copies of cards are not acceptable as proof of certification.

This certification may be revoked by the Director of the Environmental Protection Agency for violation of any of the requirements of 3745-22 or 3745-20 of the Ohio Administrative Code.

If you have any questions, please call 614-644-0226.

Sincerely,

Mark Needham
Manager, Asbestos Program
Division of Air Pollution Control



SECTION 081416 - FLUSH WOOD DOORS

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. Section Includes:

1. Five-ply flush wood veneer-faced doors for transparent finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Factory-machining criteria.
5. Factory- finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.
4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.
6. Dimensions and locations of mortises and holes for hardware.
7. Clearances and undercuts.
8. Requirements for veneer matching.
9. Doors to be factory finished and application requirements.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Field quality-control reports.

C. Sample Warranty: For special warranty.

D. Test results for screw withdrawal for each door assembly.

1.6 CLOSEOUT SUBMITTALS

A. Special warranties.

B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

C. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

D. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

B. Environmental Limitations: Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature within ranges designed for the completed and occupied building and relative humidity during remainder of construction period.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of veneer.
b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.

2.3 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with ANSI/WDMA I.S. 1A.

B. Adhesives: Do not use adhesives that contain urea formaldehyde.

C. Composite Wood Products: Products shall be made without urea formaldehyde.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Doors:

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

    a. Algoma Hardwoods, Inc.
    b. Eggers Industries.
    c. Lambton Doors.
    d. Marshfield Door Systems, Inc.
    e. VT Industries Inc.

2. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty.
3. ANSI/WDMA I.S. 1A Grade: Custom.
4. Faces: Single-ply wood veneer not less than 1/50 inch thick.

    a. Species: Select white maple.
    b. Cut: Plain sliced.
    c. Match between Veneer Leaves: Book match.
    d. Assembly of Veneer Leaves on Door Faces: Running match.
    e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
    f. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet or more.
    g. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.

5. Exposed Vertical and Top Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type A.

    a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
    b. Fire-Rated Pairs of Doors: Provide formed-steel edges and astragals with intumescent seals.

        1) Pairs of wood doors with a 45, 60, and 90 min. rating with 3 point latching, lockset and flush bolts, shall be supplied with manufacturer's standard steel edges and steel astragal, factory applied and factory prepared for hardware as scheduled. Astragal shall be mounted on key side of doors. Where active leaf is RH (right hand) or LH (left hand), the astragal shall be mounted on the inactive leaf and overlap the active leaf. Where the active leaf is RHR (right hand reverse) or LHR (left hand reverse), the astragal shall be mounted on the active leaf and overlap the inactive leaf.
        2) Where pairs of labeled doors are used in a means of egress with vertical rod exit devices, top and bottom rods or (LBR) less bottom rods, the doors shall be provided with manufacturer's standard meeting edges (metal edges, veneered treated edges, or Category "A" edge construction with intumescent material concealed by outer stile matching face veneer).

            a) Labeled doors scheduled with 2 vertical rod exit devices less bottom rods ("LBR") shall be furnished with a door-to-door thermal bolt. Door-to-floor thermal bolts or pins are not acceptable. Verify with door manufacturer their labeling requirements for this application prior to bid.

b) Where labeled doors are scheduled to receive protection plates over 16 inches high, furnish doors with blocking as required by door manufacturer for attachment of plates with screws. Verify with door manufacturer their labeling requirements for this application prior to bid. Indicate blocking in door schedule submittals.

c. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

1) Screw-Holding Capability: 550 lbf in accordance with WDMA T.M. 10.

6. Core for Non-Fire-Rated Doors:

a. ANSI A208.1, particleboard, grade as required to meet performance specifications.

1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware. Minimum dimension x length as required below:

a) 5-inch top-rail blocking, in doors indicated to have closers and exit rod hardware.
b) 5-inch bottom-rail blocking, for doors indicated to have kick, mop, armor plates, or exit rod hardware.
c) 5-inch midrail blocking, in doors indicated to have exit devices.
d) 5-inch for mortise or bored locksets.

2) Provide doors with glued-wood-stave or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087100 "Door Hardware."

b. Glued wood stave.
c. WDMA I.S. 10 structural composite lumber.

1) Screw Withdrawal, Door Face: 700 lbf.
2) Screw Withdrawal, Vertical Door Edge: 550 lbf.

7. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.

a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware. Minimum dimension x length as required below:

1) 5-inch top-rail blocking, in doors indicated to have closers and exit rod hardware.
2) 5-inch bottom-rail blocking, for doors indicated to have kick, map, armor plates, or exit rod hardware.
3) 5-inch midrail blocking, in doors indicated to have exit rods.
4) 5-inch for mortise or bored locksets.

8. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated on Drawings.

2.6 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.
2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in non-rated doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
3. Glazing: Factory install glazing in fire-rated doors indicated to be factory finished as stipulated in Section 088813 "Fire-Rated Glazing"

2.7 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. ANSI/WDMA I.S. 1A Grade: Custom.
2. Finish: ANSI/WDMA I.S. 1A TR-4 Conversion Varnish.
3. Finish: ANSI/WDMA I.S. 1A TR-6 Catalyzed Polyurethane.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Job-Fitted Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated below.

a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.

2. Machine doors for hardware.
3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
4. Clearances:

a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
c. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
d. Comply with NFPA 80 for fire-rated doors.

5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

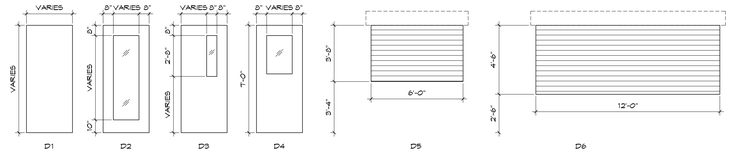
B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

DOOR SCHEDULE

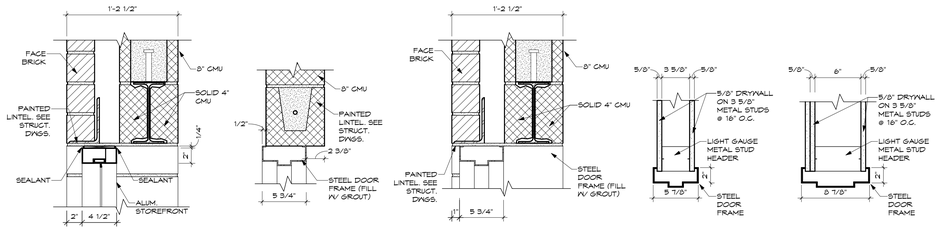
NOTES:

DOOR NO.	EXISTING / NEW	INTERIOR / EXTERIOR	SINGLE / PAIR	DOOR SIZE			DOOR			FRAME				HARDWARE SET #	FIRE RATING	REMARKS	DOOR NO.
				WIDTH	HEIGHT	THICKNESS	TYPE	MATERIAL	GLAZING	TYPE	MATERIAL	DETAILS JAMB	DETAILS HEAD				
01 FIRST FLOOR																	
101	NEW	EXT	PAIR	3'-0"	7'-0"	1 3/4"	D2	ALUM	LAMINATED, INSULATED	AF04	ALUM	-	-	18			101
102	NEW	INT	PAIR	3'-0"	7'-0"	1 3/4"	D2	ALUM	LAMINATED, INSULATED	AF06	ALUM	-	-	02			102
103A	NEW	INT	PAIR	3'-0"	7'-0"	1 3/4"	D3	WD	LAMINATED	F1	HM	J6	H5	14			103A
103B	NEW	INT	PAIR	3'-0"	7'-0"	1 3/4"	D3	WD	LAMINATED	F1	HM	J5	H5	14			103B
103C	NEW	INT	PAIR	3'-0"	7'-0"	1 3/4"	D3	WD	LAMINATED	F1	HM	J5	H5	14			103C
104	NEW	INT	PAIR	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J6	H6	11			104
105	NEW	EXT	PAIR	2'-10"	7'-0"	1 3/4"	D2	ALUM	LAMINATED, INSULATED	AF02				21			105
107	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J2	H2	12			107
108A	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J2	H2	10			108A
109	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	N/A	EXIST.	HM	EXIST.	EXIST.	23			109
110A	NEW	EXT	PAIR	3'-0"	7'-0"	1 3/4"	D1	INSULATED KM.	N/A	F1	HM	J3	H3	14			110A
110B	NEW	INT	PAIR	3'-0"	7'-0"	1 3/4"	D3	WD	FIRE-RATED	F1	HM	J2	H2	15	60 MIN.		110B
111A	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			111A
111B	EXIST	EXT	SINGLE	3'-0"	7'-0"	1 3/4"		EXIST.	EXIST.	EXIST.		EXIST.	EXIST.	23			111B
112	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	FIRE-RATED	F1	HM	J2	H2	20	60 MIN.		112
114	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			114
115	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			115
116	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			116
117	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			117
118	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			118
119A	EXIST	INT	PAIR	3'-0"	7'-0"	1 3/4"	D4	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			119A
119B	EXIST	EXT	PAIR	3'-0"	7'-0"	1 3/4"	D4	EXIST.	EXIST.	EXIST.	ALUM	EXIST.	EXIST.	22			119B
120	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D3	FIRE RATED	LAMINATED	F1	HM	J2	H2	17	60 MIN.		120
121	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	LAMINATED	F1	HM	J6	H6	10			121
121B	EXIST	EXT	SINGLE	2'-10"	7'-0"	1 3/4"	D4	EXIST.	EXIST.	EXIST.	ALUM	EXIST.	EXIST.	23			121B
122	EXIST	INT	SINGLE	2'-6"	7'-0"	1 3/4"	D1	EXIST.	N/A	EXIST.	HM	EXIST.	EXIST.	23			122
123	EXIST	INT	SINGLE	2'-6"	7'-0"	1 3/4"	D1	EXIST.	N/A	EXIST.	HM	EXIST.	EXIST.	23			123
124	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	LAMINATED	F1	HM	J6	H6	10			124
125	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			125
126	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			126
127	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			127
128	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			128
130	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			130
131	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			131
132A	EXIST	EXT	PAIR	3'-0"	7'-0"	1 3/4"	D2	EXIST.	EXIST.	EXIST.	ALUM	EXIST.	EXIST.	22			132A
132B	NEW	INT	DOUBLE EGRESS	3'-0"	7'-0"	1 3/4"	D2	WD	LAMINATED	F1	HM	J4 SIM	H4 SIM	03			132B
133	NEW	INT	PAIR	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J4	H4	13			133
134	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			134
135A	NEW	INT	SINGLE	3'-0"	7'-2"	1 3/4"	D3	WD	LAMINATED	F1	HM	JT SIM	HT SIM	04			135A
135B	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	EXIST.	EXIST.	HM	EXIST.	EXIST.	23			135B
135C	NEW	INT	SINGLE	6'-0"	9'-8"		D5	PER MFG.	N/A	PER MFG.	PER MFG.			24		COILING COUNTER DOOR	135C
136	EXIST	INT	SINGLE	2'-8"	7'-0"	1 3/4"	D1	EXIST.	N/A	EXIST.	HM	EXIST.	EXIST.	23			136
137	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J4	H4	01			137
138	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J4	H4	01			138
139	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	N/A	EXIST.	HM	EXIST.	EXIST.	23			139
141	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	N/A	EXIST.	HM	EXIST.	EXIST.	23			141
144	NEW	INT	PAIR	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J2	H2	25			144
01 MID LEVEL																	
106	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J5	H5	12			106
02 SECOND FLOOR																	
202A	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J4	H4	7			202A
202B	NEW	INT	SINGLE	12'-0"	4'-8"		D6	PER MFG.	N/A	PER MFG.	PER MFG.			24		COILING COUNTER DOOR	202B
203A	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D3	WD	LAMINATED	F1	HM	J4	H4	16			203A
203B	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D3	WD	LAMINATED	F1	HM	J4	H4	16			203B
204	NEW	INT	PAIR	3'-0"	7'-0"	1 3/4"	D3	WD	LAMINATED	F1	HM	J5	H5	14			204
205A	NEW	INT	DOUBLE EGRESS	3'-0"	7'-0"	1 3/4"	D2	WD	LAMINATED	F1	HM	J4 SIM	H4 SIM	03			205A
205B	NEW	INT	SINGLE	3'-0"	7'-2"	1 3/4"	D1	WD	N/A	F1	HM	J6 SIM	H6 SIM	12			205B
206	EXIST	INT	PAIR	3'-0"	7'-0"	1 3/4"	D4	EXIST.	LAMINATED	EXIST.	HM	EXIST.	EXIST.	22			206
207A	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D2	WD	LAMINATED	F1	HM	J2	H2	07			207A
207B	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D2	WD	LAMINATED	F1	HM	J2	H2	09			207B
207C	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	LAMINATED	EXIST.	HM	EXIST.	EXIST.	23			207C
209	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	N/A	EXIST.	HM	EXIST.	EXIST.	23			209
210	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	N/A	EXIST.	HM	EXIST.	EXIST.	23			210
211	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	LAMINATED	EXIST.	HM	EXIST.	EXIST.	23			211
212	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	LAMINATED	EXIST.	HM	EXIST.	EXIST.	23			212
213	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	LAMINATED	EXIST.	HM	EXIST.	EXIST.	23			213
214	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	LAMINATED	EXIST.	HM	EXIST.	EXIST.	23			214
215	EXIST	INT	SINGLE	2'-10"	7'-0"	1 3/4"	D1	EXIST.	N/A	EXIST.	HM	EXIST.	EXIST.	23			215
216	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D2	WD	LAMINATED	F1	HM	J4	H4	07			216
217	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D2	WD	LAMINATED	F1	HM	J4	H4	07			217
218	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D2	WD	LAMINATED	F1	HM	J4	H4	07			218
219	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D2	WD	LAMINATED	F1	HM	J4	H4	07			219
220A	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D2	ALUM	LAMINATED	F1	ALUM	-	-	05			220A
220B	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D4	EXIST.	LAMINATED	EXIST.	HM	EXIST.	EXIST.	23			220B
221	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J4	H4	12			221
222	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J4	H4	08			222
223	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J4	H4	01			223
224	NEW	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	WD	N/A	F1	HM	J4	H4	01			224
225	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	N/A	EXIST.	HM	EXIST.	EXIST.	23			225
226	EXIST	INT	SINGLE	3'-0"	7'-0"	1 3/4"	D1	EXIST.	N/A	EXIST.	HM	EXIST.	EXIST.	23			226

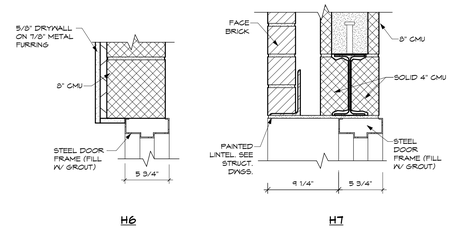


1 DOOR TYPE
SCALE: N.T.S.

2 DOOR FRAME TYPE
SCALE: N.T.S.

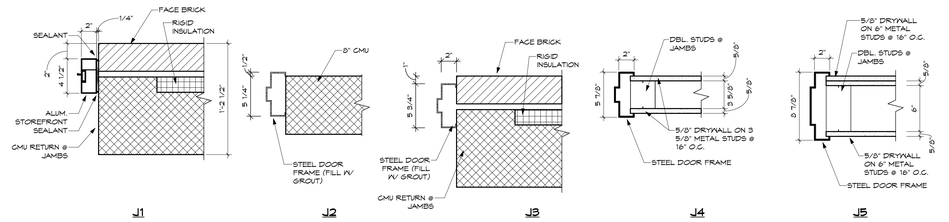


H1 H2 H3 H4 H5

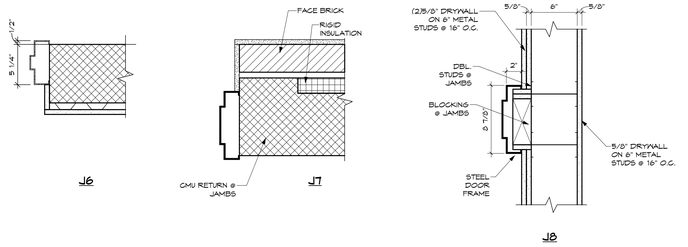


H6 H7

3 DOOR HEAD DETAIL
SCALE: N.T.S.



J1 J2 J3 J4 J5



J6 J7 J8

5 DOOR JAMB DETAIL
SCALE: N.T.S.

SHEET NOTES:

GENERAL NOTES:

KEY PLAN:

No.	Revisions / Submissions	Date
1	ADDENDUM #1	3/15/2021

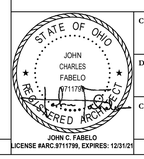
LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

WAYNESVILLE PERFORMING ARTS CENTER

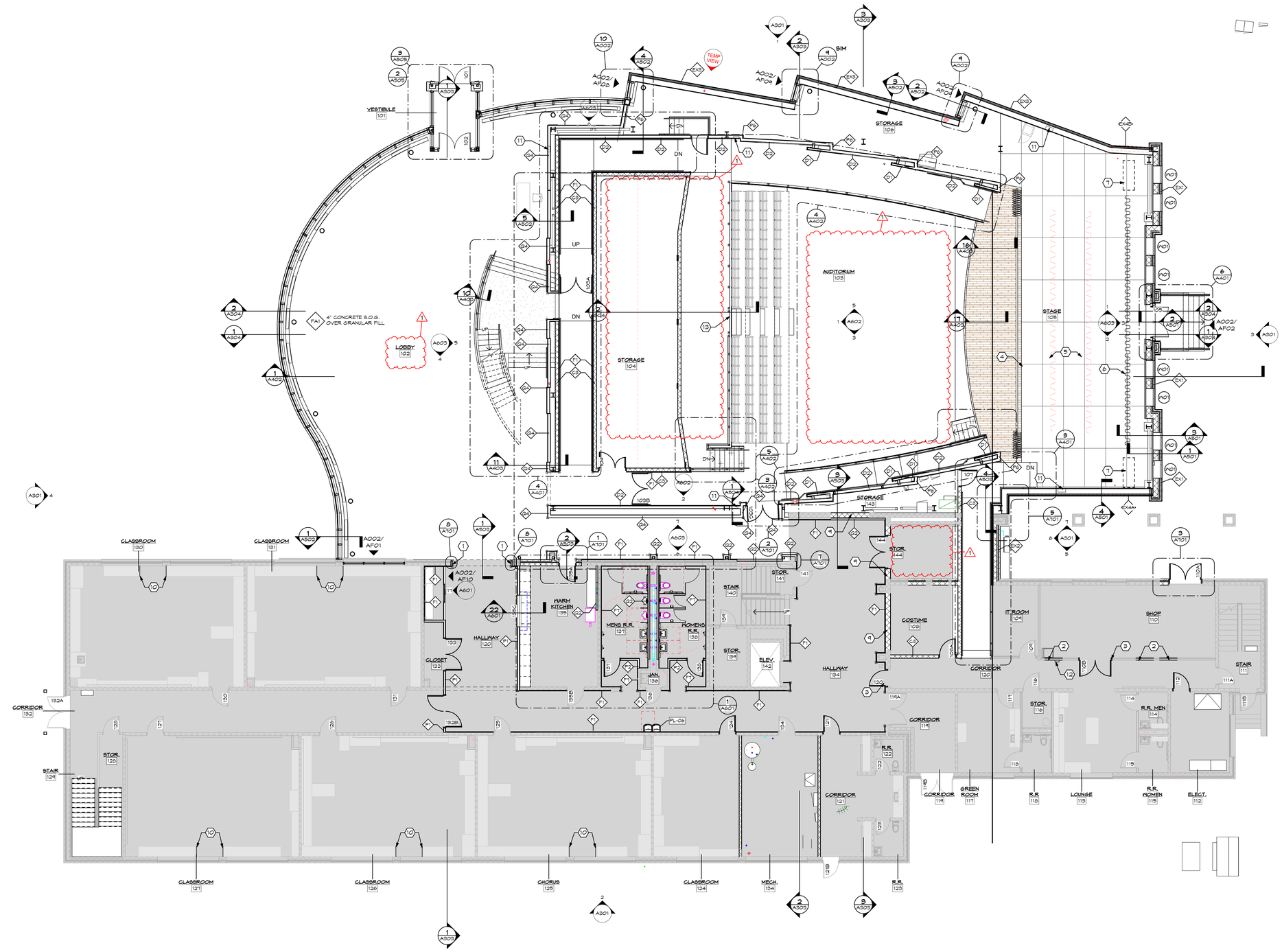
625 DAYTON RD.
WAYNESVILLE, OH 45068

DOOR SCHEDULES AND DETAILS



JOHN C. FABELO
LICENSE #ARC.9711179, EXPIRES: 12/31/21

Comm. No.	Date
18620.00	2021/03/01
Drawn: PA	Drawing No.: A001
Checked: EGS	



1 FIRST FLOOR PLAN
SCALE: 1/8" = 1'-0"

SHEET NOTES:

1. TOOTH IN FACE BRICK AT NEW OPENING USING SALVAGE BRICK. CREATE A CLEAR CASED OPENING.
2. IN FILL FORMER DOOR OPENING WITH DRYWALL.
3. NEW DOOR OPENING IN EXISTING CMU WALL. TOOTH CMU AT JAMBS INTO EXISTING CMU.
4. MAIN CURTAIN. SEE SPECS.
5. BORDER CURTAIN. SEE SPECS.
6. REAR CURTAIN. SEE SPECS.
7. REAR CURTAIN STACK AREA. EXTEND TRACK WALL-TO-WALL.
8. PROVIDE PLASTIC LAMINATE END PANELS TO COVER END OF EXPOSED CASEWORK WHERE ADJACENT CABINETS REMOVED.
9. IN FILL FORMER OPENING WITH CMU. TOOTH NEW CMU INTO EXISTING.
10. PROVIDE NEW 1 1/4" THICK PLASTIC LAMINATE END PANEL TO CONCEAL END OF METAL BOOKSHELVING WHERE UNIT VENTILATOR REMOVED. ON SECOND FLOOR PATCH PIPE HOLES THROUGH FLOOR WITH CONCRETE. END PANEL TO MATCH PROFILE OF SHELVES. SEE FINISH PLANS FOR PATCHING OF FLOORING AND PAINTING.
11. RECESSED FIRE EXTINGUISHER AND CABINET.
12. SEMI-RECESSED FIRE EXTINGUISHER AND CABINET.
13. REMOVEABLE GLASS PANEL AT TOP OF TELESCOPING SEATING AISLE. MATCH DETAILING OF ADJACENT GLASS PANEL RAILING SYSTEM
14. PROVIDE AISLE LIGHT IN SEATS INDICATED BY "J". SEE SPECS AND ELECTRICAL DWGS.
15. FLOOR EXPANSION JOINT COVER. SEE SPECS.

GENERAL NOTES:

KEY PLAN:

No.	Revisions / Submissions	Date
1	ADDENDUM #1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

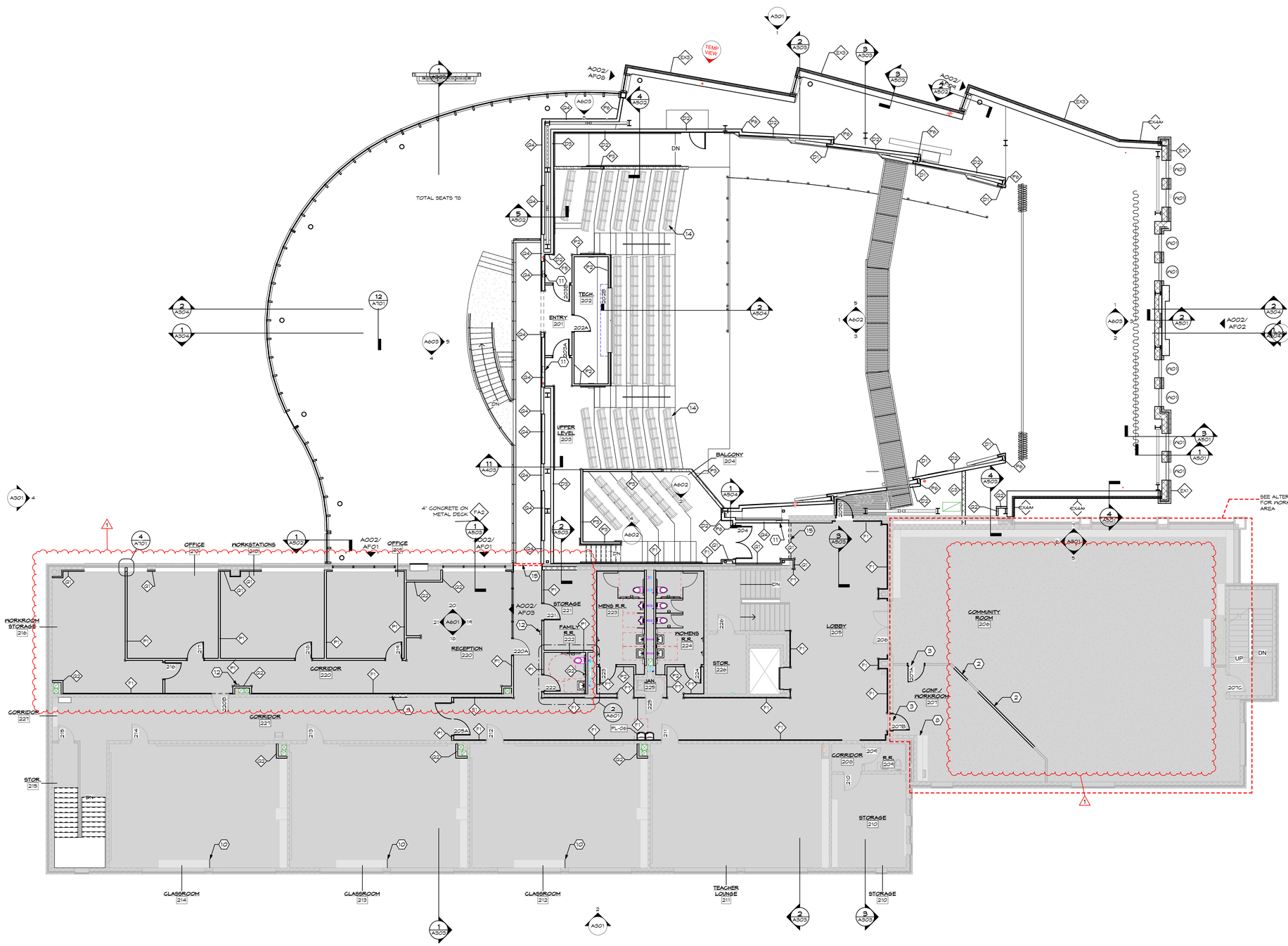
WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

FIRST FLOOR PLAN

STATE OF OHIO
JOHN CHARLES FABELO
71179
REGISTERED ARCHITECT
JOHN C. FABELO
LICENSE #ARC.071179, EXPIRES: 12/31/21

Comm. No. 18620.00	Date 2021/03/01
Drawn PA	Drawing No. A101
Checked EGS	



1 SECOND FLOOR PLAN
SCALE: 1/8" = 1'-0"

SHEET NOTES:

1. TOOTH IN FACE BRICK AT NEW OPENING USING SALVAGE BRICK. CREATE A CLEAR CASED OPENING.
2. IN FILL FORMER DOOR OPENING WITH DRYWALL.
3. NEW DOOR OPENING IN EXISTING CMU WALL. TOOTH CMU AT JAMBS INTO EXISTING CMU.
4. MAIN CURTAIN. SEE SPECS.
5. BORDER CURTAIN. SEE SPECS.
6. REAR CURTAIN. SEE SPECS.
7. REAR CURTAIN STACK AREA. EXTEND TRACK WALL-TO-WALL.
8. PROVIDE PLASTIC LAMINATE END PANELS TO COVER END OF EXPOSED CASEWORK WHERE ADJACENT CABINETS REMOVED.
9. IN FILL FORMER OPENING WITH CMU. TOOTH NEW CMU INTO EXISTING.
10. PROVIDE NEW 1 1/4" THICK PLASTIC LAMINATE END PANEL TO CONCEAL END OF METAL BOOKSHELVING WHERE UNIT VENTILATOR REMOVED. ON SECOND FLOOR PATCH PIPE HOLES THROUGH FLOOR WITH CONCRETE. END PANEL TO MATCH PROFILE OF SHELVES. SEE FINISH PLANS FOR PATCHING OF FLOORING AND PAINTING.
11. RECESSED FIRE EXTINGUISHER AND CABINET.
12. SEMI-RECESSED FIRE EXTINGUISHER AND CABINET.
13. REMOVEABLE GLASS PANEL AT TOP OF TELESCOPING SEATING AISLE. MATCH DETAILING OF ADJACENT GLASS PANEL RAILING SYSTEM.
14. PROVIDE AISLE LIGHT IN SEATS INDICATED BY 'J'. SEE SPECS AND ELECTRICAL DWGS.
15. FLOOR EXPANSION JOINT COVER. SEE SPECS.

GENERAL NOTES:

KEY PLAN:

No.	Revisions / Submissions	Date
1	ADDENDUM #1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

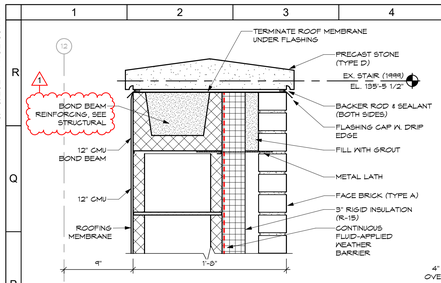
WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

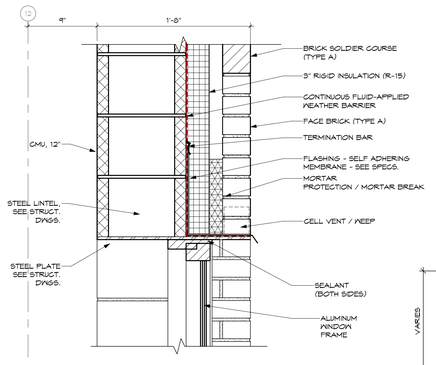
SECOND FLOOR PLAN

STATE OF OHIO
JOHN CHARLES FABELO
7711799
REGISTERED ARCHITECT
JOHN C. FABELO
LICENSE #ARC.8711799, EXPIRES: 12/31/21

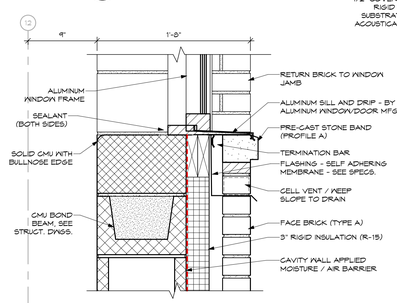
Comm. No. 18620.00	Date 2021/03/01
Drawn PA	Drawing No. A102
Checked EGS	



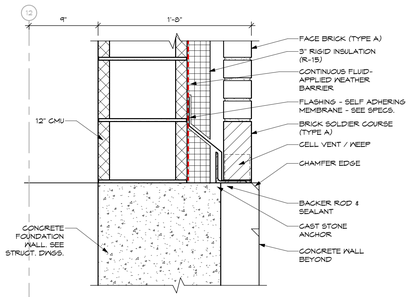
9 HISTORICAL WALL CAP
SCALE: 1 1/2" = 1'-0"



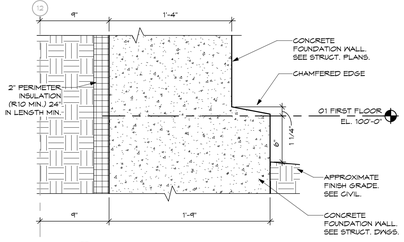
8 HISTORICAL WINDOW HEAD
SCALE: 1 1/2" = 1'-0"



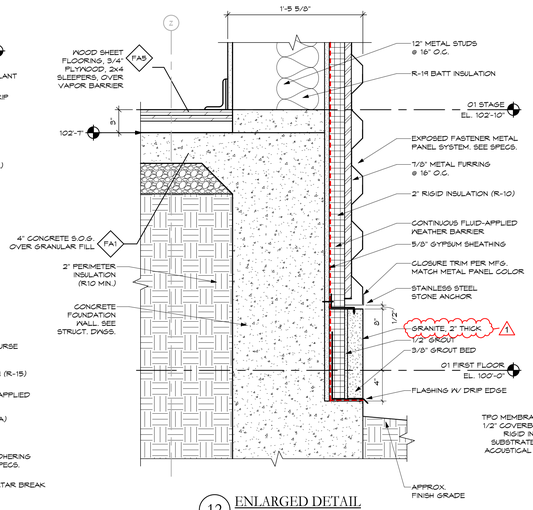
7 HISTORICAL WINDOW SILL
SCALE: 1 1/2" = 1'-0"



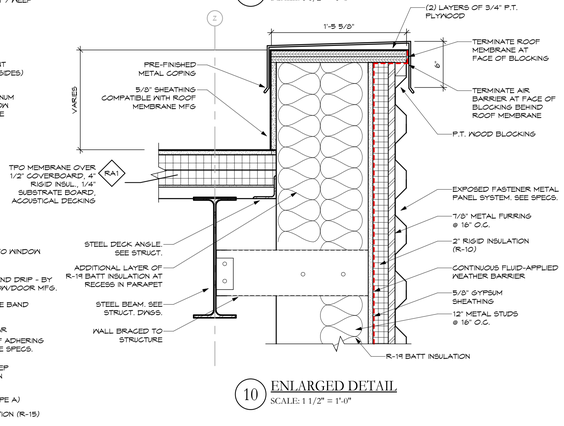
6 HISTORICAL WALL RECESS HEAD
SCALE: 1 1/2" = 1'-0"



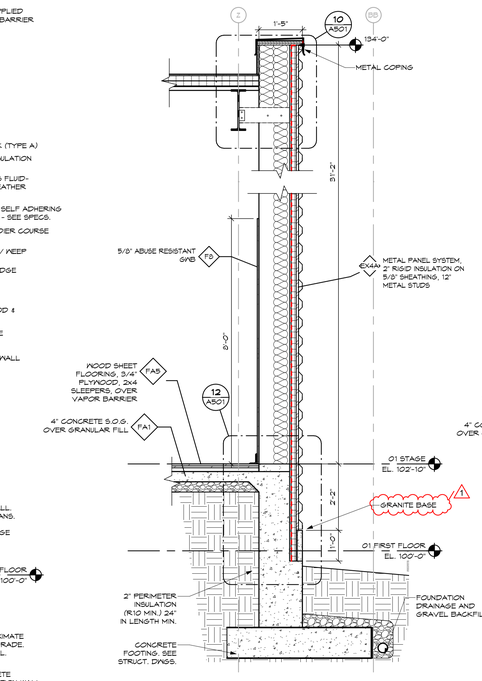
5 HISTORICAL WALL RECESS SILL
SCALE: 1 1/2" = 1'-0"



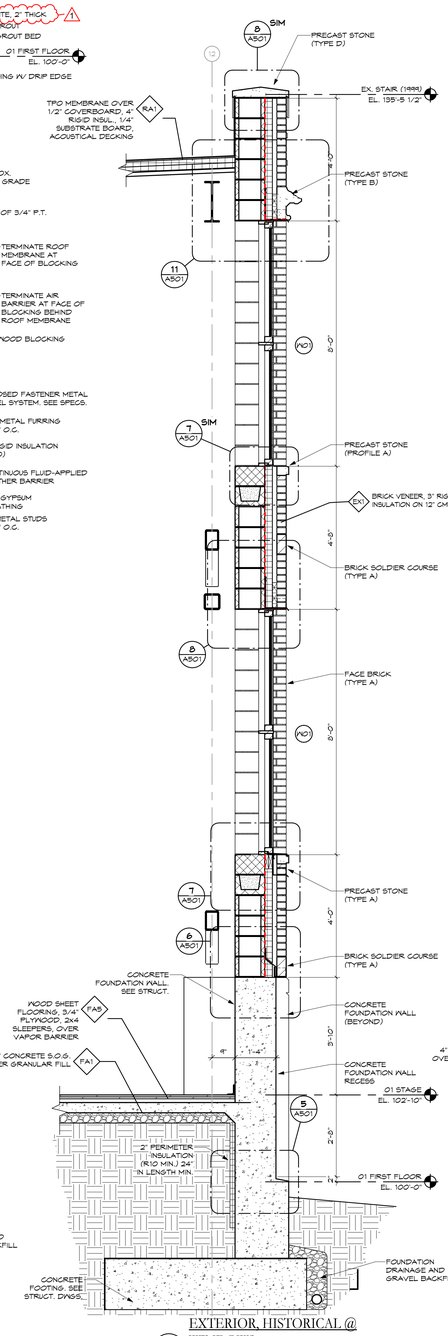
12 ENLARGED DETAIL
SCALE: 1 1/2" = 1'-0"



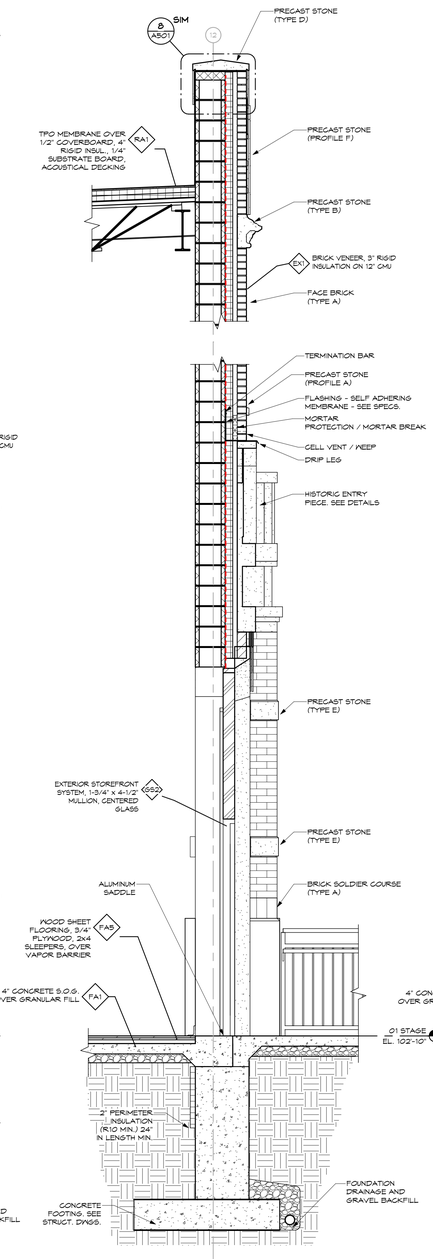
10 ENLARGED DETAIL
SCALE: 1 1/2" = 1'-0"



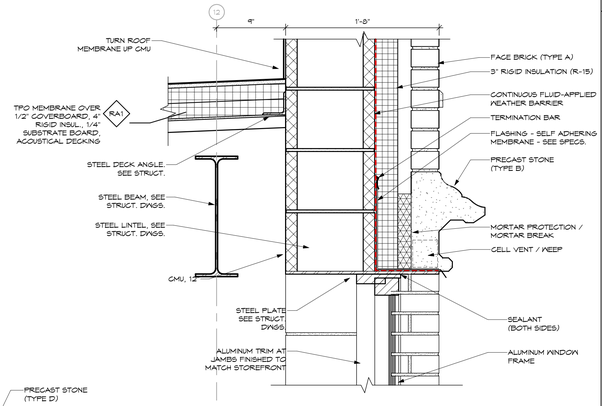
4 EXTERIOR, METAL RIB WALL
SCALE: 1/2" = 1'-0"



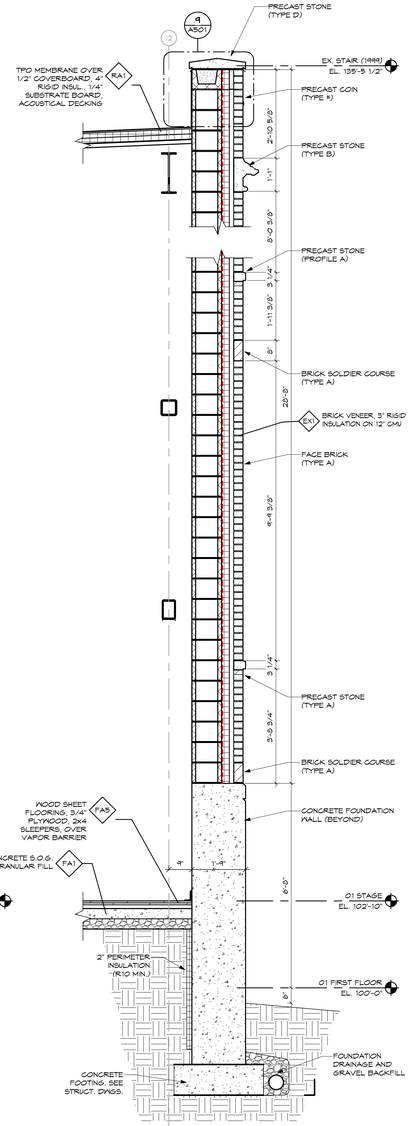
3 EXTERIOR, HISTORICAL @ WINDOWS
SCALE: 1/2" = 1'-0"



2 EXTERIOR, HISTORICAL @ ENTRY
SCALE: 1/2" = 1'-0"



11 HISTORICAL WINDOW HEAD, UPPER
SCALE: 1 1/2" = 1'-0"



1 EXTERIOR, HISTORICAL TYP.
SCALE: 1/2" = 1'-0"

SHEET NOTES:

GENERAL NOTES:

KEY PLAN:

No.	Revisions / Submissions	Date
1	ADDENDUM #1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

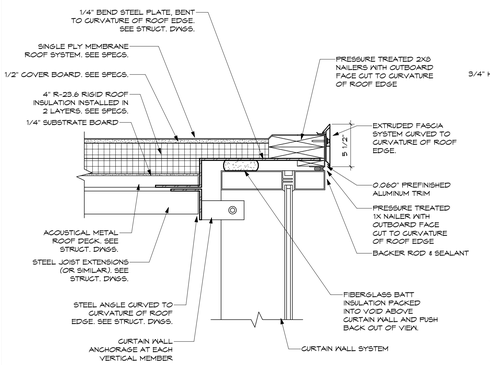
WALL SECTIONS, DETAILS, AND PLAN DETAILS

STATE OF OHIO — JOHN CHARLES FABELO — 8/11/19 — REGISTERED ARCHITECT
JOHN C. FABELO
LICENSE #ARC.8711799, EXPIRES: 12/31/21

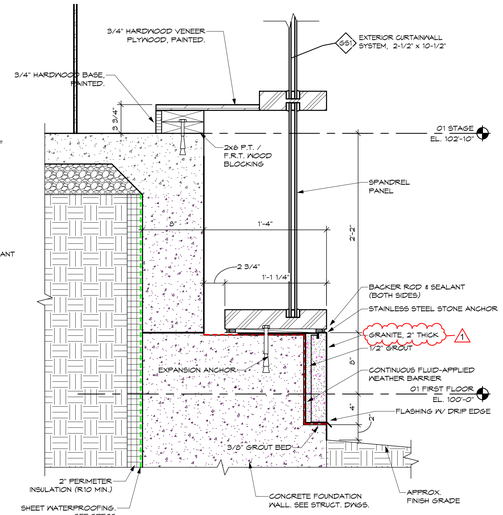
Comm. No.	Date
18620.00	2021/03/01
Drawn: PA	Drawing No.: A501
Checked: EGS	

3/15/2021 11:52:59 AM

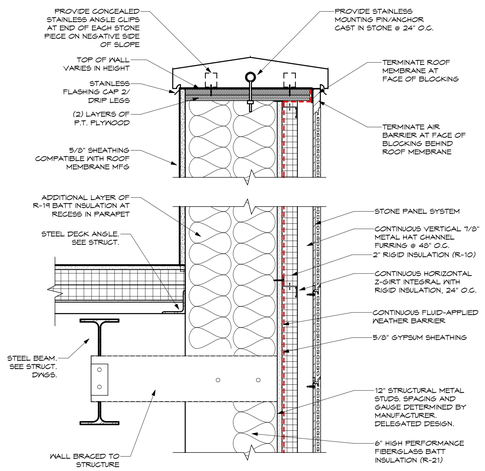
C:\Revit\2020\18620.00-Wayne LSD Performing Arts Center& Renovation-R20-Arch Central_dburke@lwcinspires.com.rvt



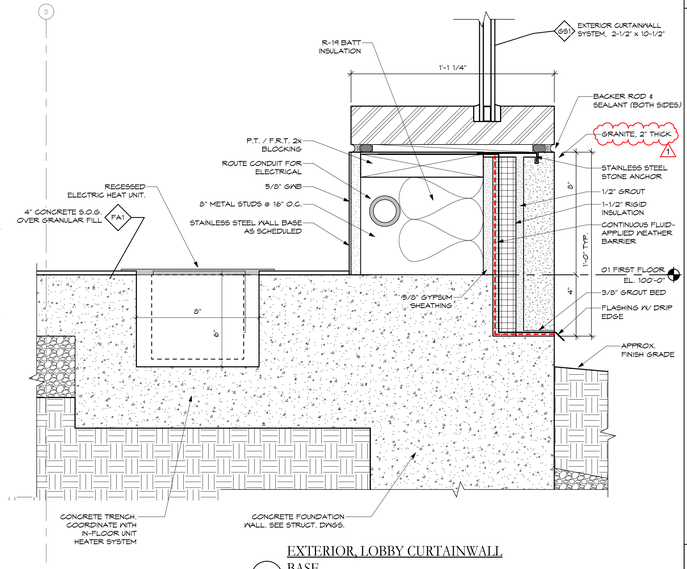
9 ENLARGED ROOF EDGE AT CURTAINWALL
SCALE: 1 1/2" = 1'-0"



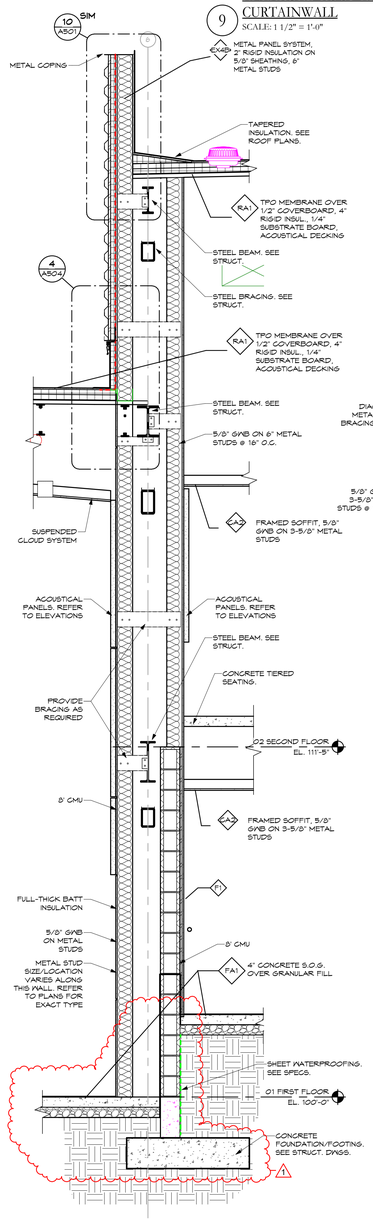
8 ENLARGED DETAIL AT STORAGE WINDOWS
SCALE: 1 1/2" = 1'-0"



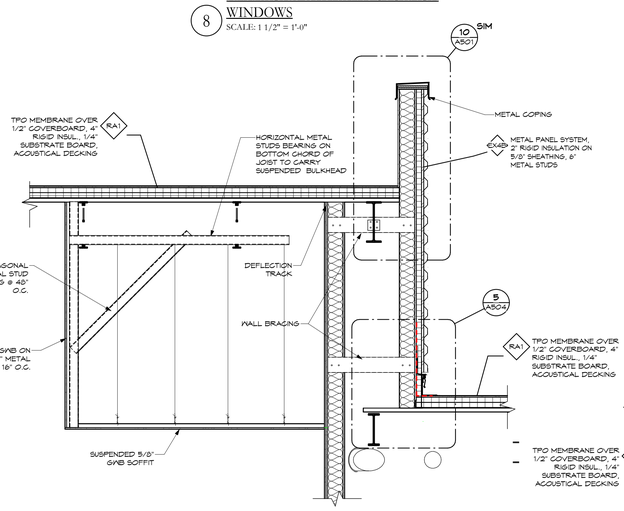
7 EXTERIOR, NORTH WALL STONE @ HEAD
SCALE: 1 1/2" = 1'-0"



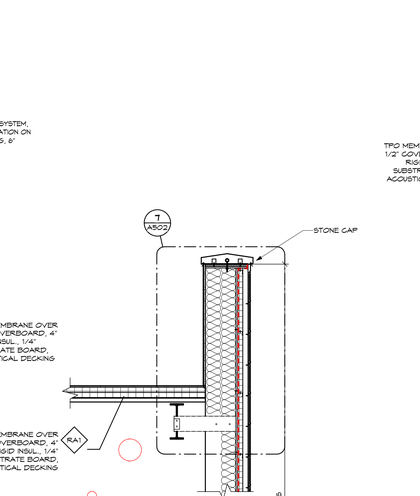
6 EXTERIOR, LOBBY CURTAINWALL BASE
SCALE: 3" = 1'-0"

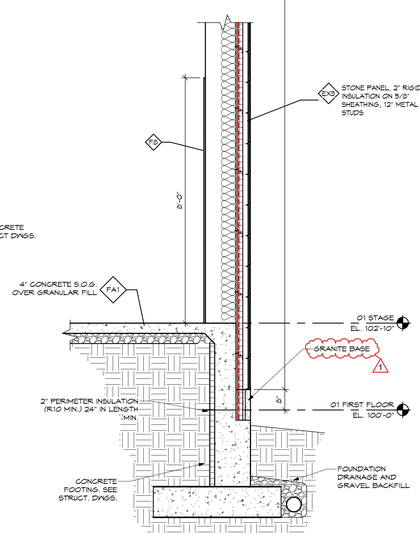


5 AUDITORIUM FEATURE WALL
SCALE: 1/2" = 1'-0"

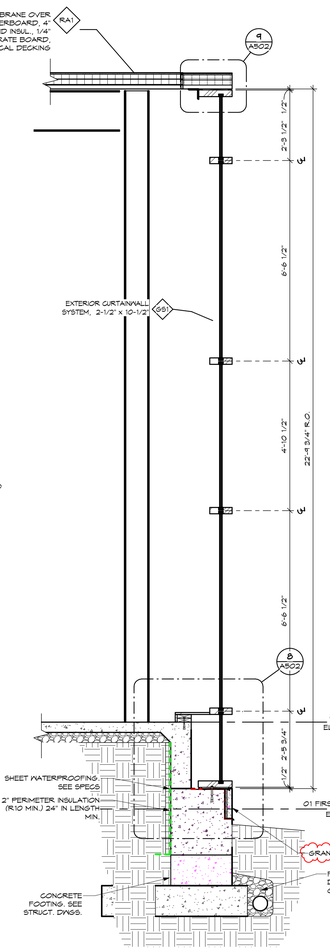


4 AUDITORIUM WALL AT NORTH STORAGE
SCALE: 1/2" = 1'-0"

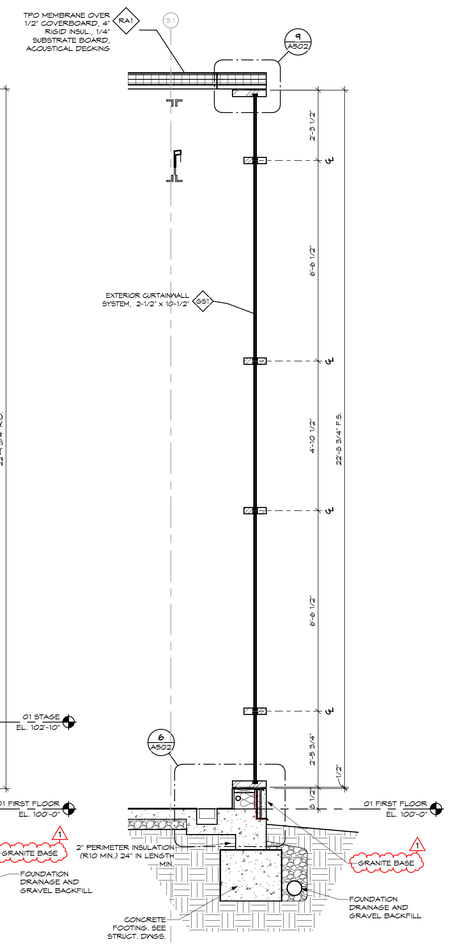




3 TYPICAL STONE PANEL WALL
SCALE: 1/2" = 1'-0"



2 NORTH CURTAINWALL AT BUMPOUT
SCALE: 1/2" = 1'-0"



1 LOBBY CURTAINWALL SYSTEM
SCALE: 1/2" = 1'-0"

SHEET NOTES:

GENERAL NOTES:

KEY PLAN:

No.	Revisions / Submissions	Date
1	ADDENDUM #1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

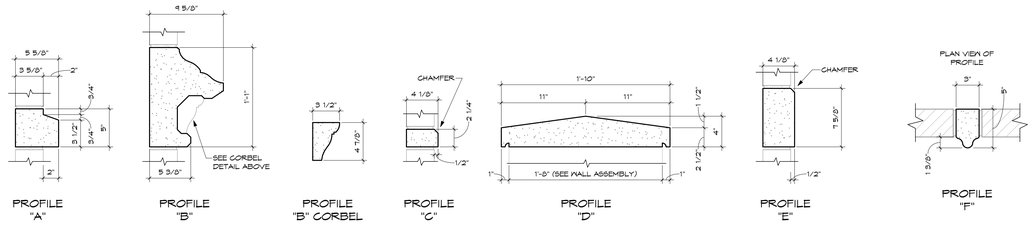
WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

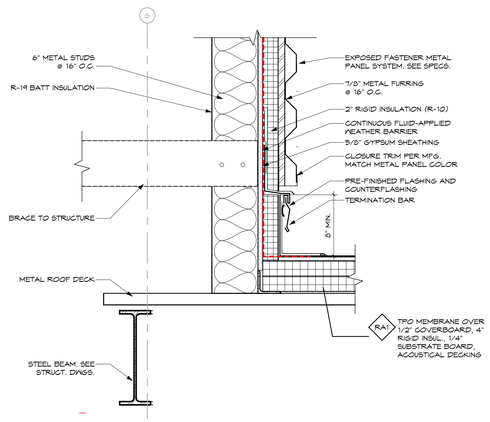
WALL SECTIONS, DETAILS, AND PLAN DETAILS

STATE OF OHIO — JOHN CHARLES FABELO — 71179 — REGISTERED ARCHITECT
JOHN C. FABELO
LICENSE #ARC.9711799, EXPIRES: 12/31/21

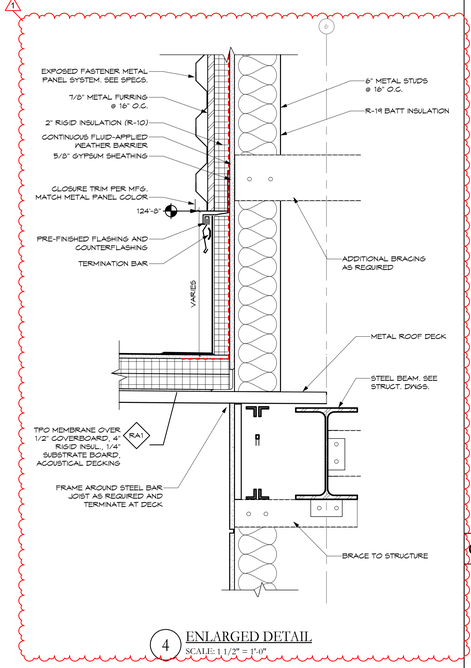
Comm. No. 18620.00	Date 2021/03/01
Drawn PA	Drawing No. A502
Checked EGS	



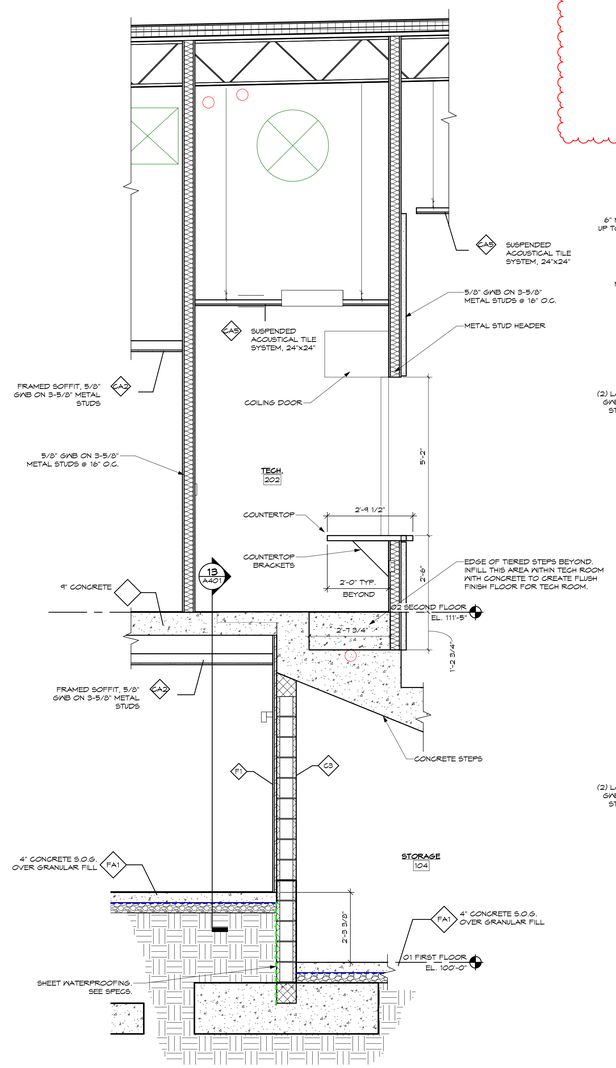
6 PRE-CAST STONE PROFILES
SCALE: 1 1/2" = 1'-0"



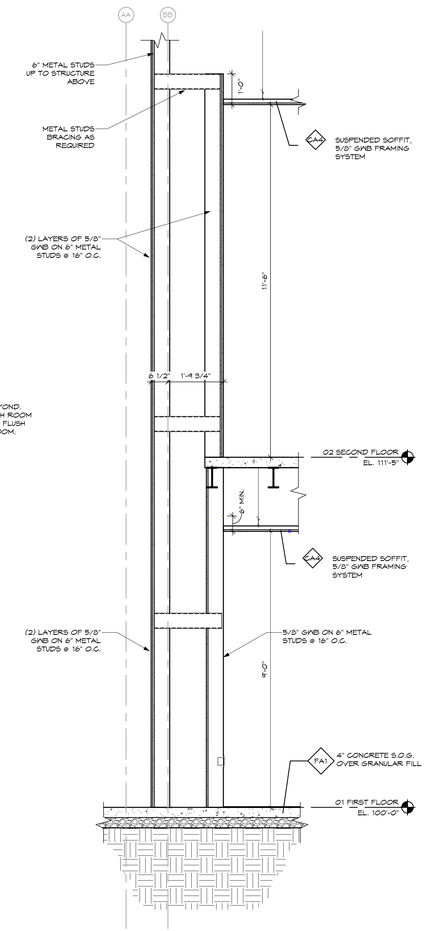
5 ENLARGED DETAIL
SCALE: 1 1/2" = 1'-0"



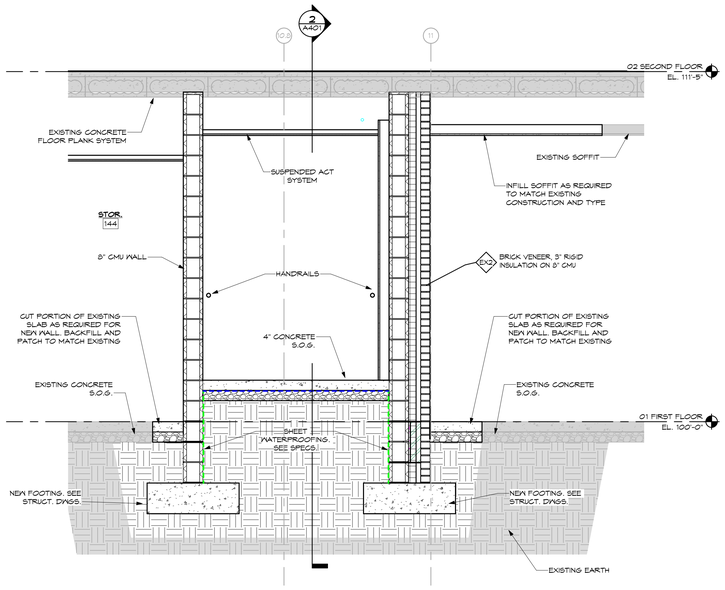
4 ENLARGED DETAIL
SCALE: 1 1/2" = 1'-0"



2 WALL SECTION
SCALE: 1/2" = 1'-0"



1 WALL SECTION
SCALE: 1/2" = 1'-0"



EXTERIOR - BACK OF STAGE
RAMP
3 SCALE: 1/2" = 1'-0"

SHEET NOTES:

GENERAL NOTES:

KEY PLAN:

No.	Revisions / Submissions	Date
1	ADDENDUM #1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

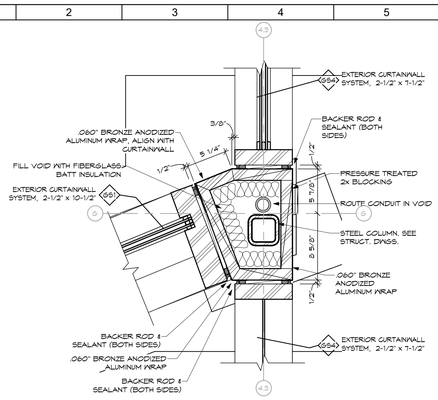
WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

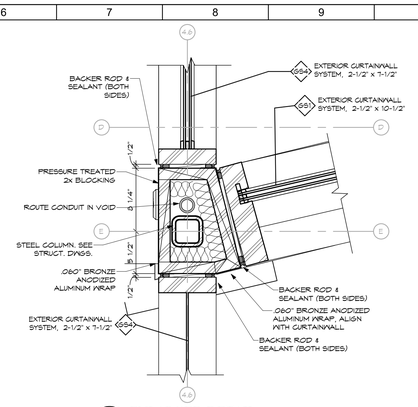
WALL SECTIONS, DETAILS, AND PLAN DETAILS

STATE OF OHIO
JOHN CHARLES FABELO
#71179
REGISTERED ARCHITECT
JOHN C. FABELO
LICENSE #ARC.8711799, EXPIRES: 12/31/21

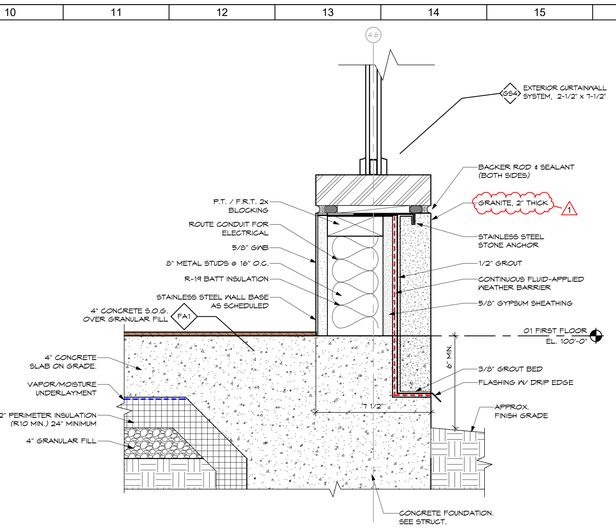
Comm. No. 18620.00	Date 2021/03/01
Drawn PA	Drawing No. A504
Checked EGS	



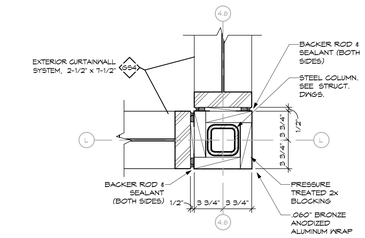
13 ENLARGED DETAIL
SCALE: 1 1/2" = 1'-0"



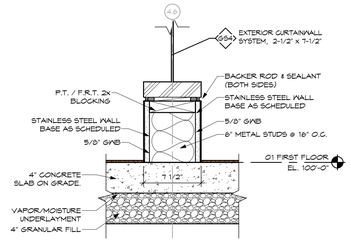
12 ENLARGED DETAIL
SCALE: 1 1/2" = 1'-0"



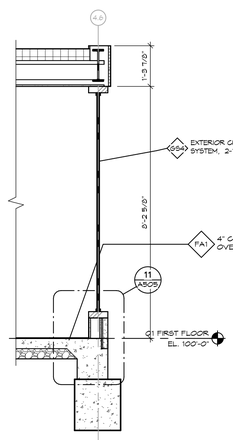
11 ENLARGED BASE DETAIL @ EXTERIOR
SCALE: 3" = 1'-0"



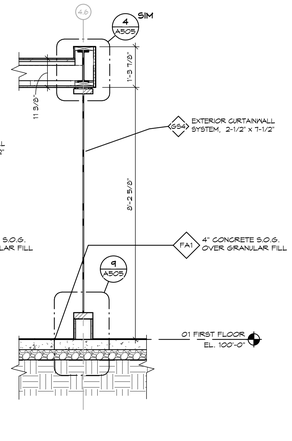
10 ENLARGED DETAIL
SCALE: 1 1/2" = 1'-0"



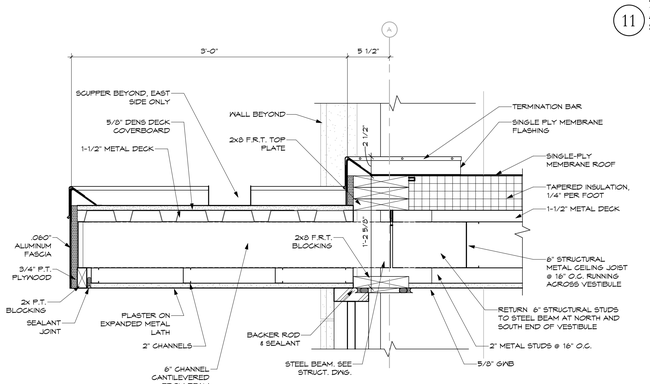
9 ENLARGED BASE DETAIL @ INTERIOR
SCALE: 1 1/2" = 1'-0"



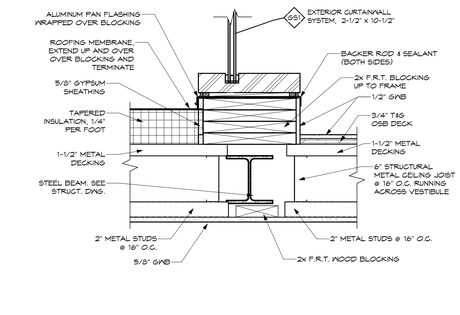
8 VESTIBULE WALL SECTION @ EXTERIOR
SCALE: 1/2" = 1'-0"



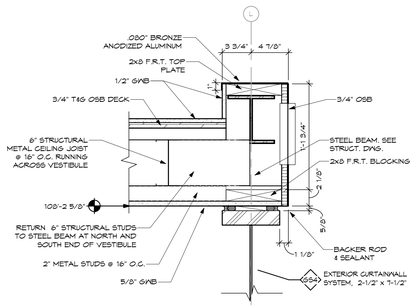
7 VESTIBULE WALL SECTION @ INTERIOR
SCALE: 1/2" = 1'-0"



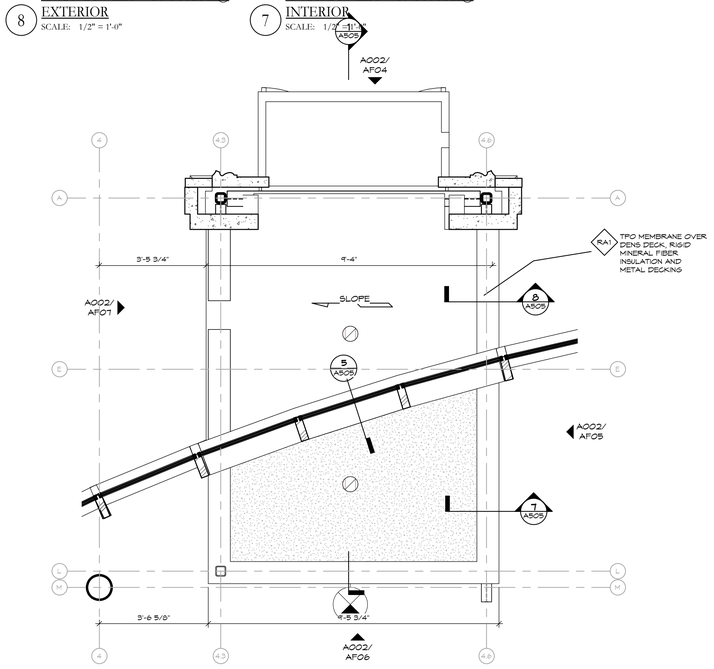
6 ENLARGED DETAIL
SCALE: 1 1/2" = 1'-0"



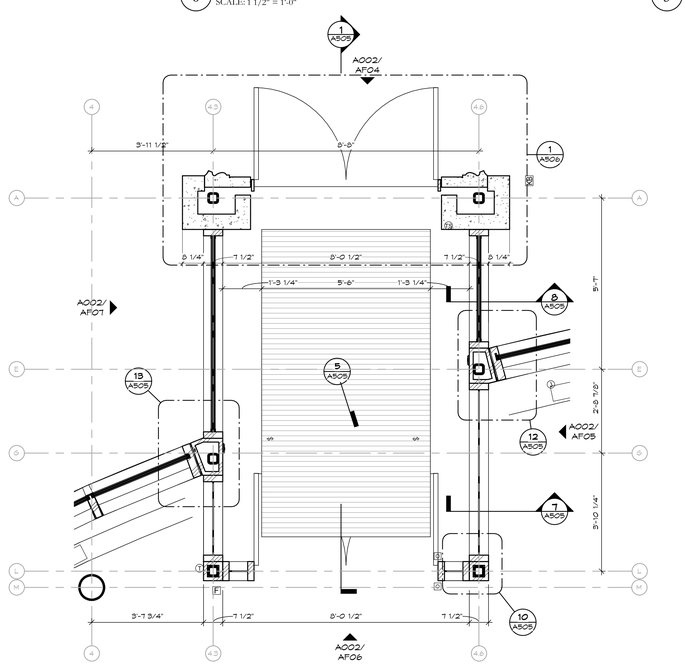
5 ENLARGED DETAIL
SCALE: 1 1/2" = 1'-0"



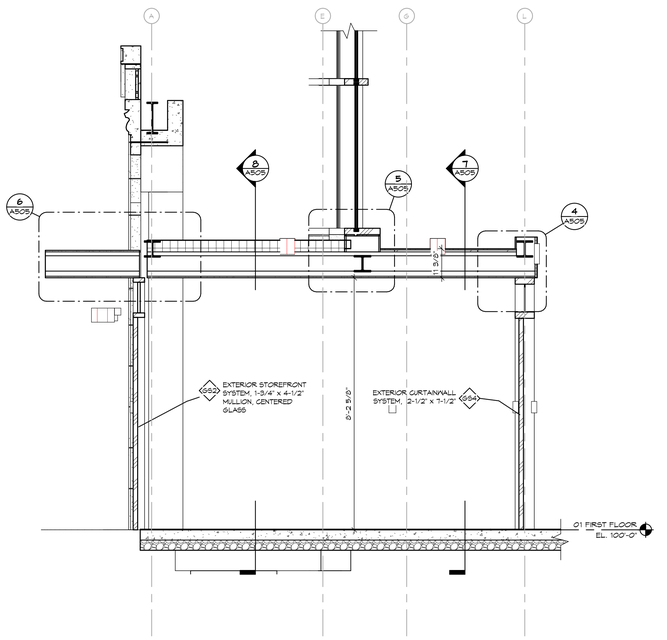
4 ENLARGED DETAIL
SCALE: 1 1/2" = 1'-0"



3 ENLARGED VESTIBULE ROOF PLAN
SCALE: 1/2" = 1'-0"



2 ENLARGED VESTIBULE FLOOR PLAN
SCALE: 1/2" = 1'-0"



1 VESTIBULE CROSS SECTION
SCALE: 1/2" = 1'-0"

SHEET NOTES:

GENERAL NOTES:

KEY PLAN:

No.	Revisions / Submissions	Date
1	ADDENDUM #1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

WAYNESVILLE PERFORMING ARTS CENTER

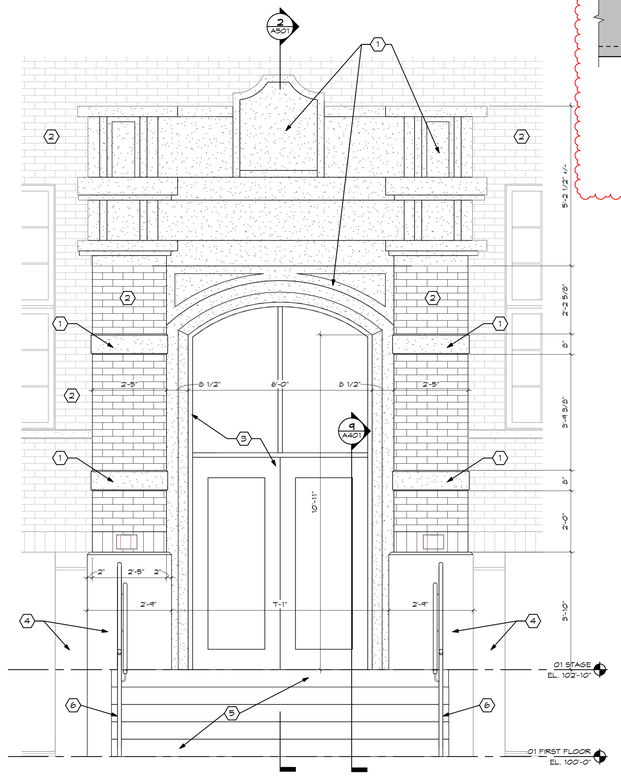
625 DAYTON RD.
WAYNESVILLE, OH 45068

WALL SECTIONS, DETAILS, AND PLAN DETAILS

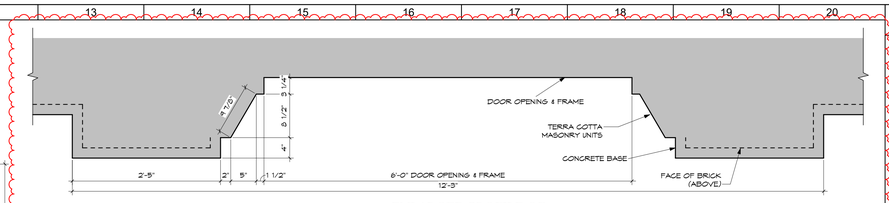
STATE OF OHIO
JOHN CHARLES FABELO
7711799
REGISTERED ARCHITECT
JOHN C. FABELO
LICENSE #ARC.8711799, EXPIRES: 12/31/21

Comm. No. 18620.00	Date 2021/03/01
Drawn PA	Drawing No. A505
Checked EGS	

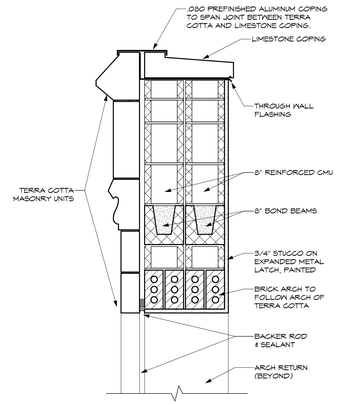
1915 ENTRANCE ARCH PHOTOGRAPH
11 SCALE: N.T.S.



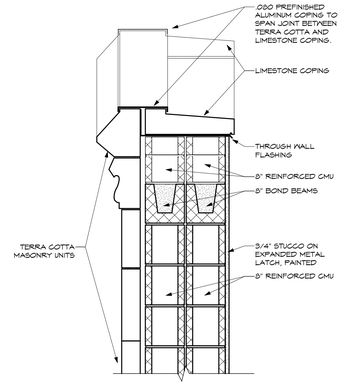
ENLARGED ENTRY FACADE
10 SCALE: N.T.S.



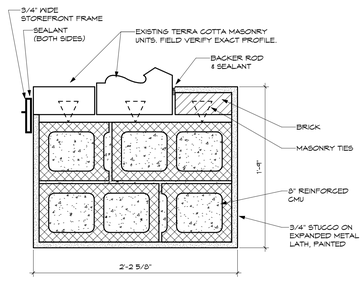
ENLARGED PROFILE OF HISTORIC ENTRY
12 SCALE: 1" = 1'-0"



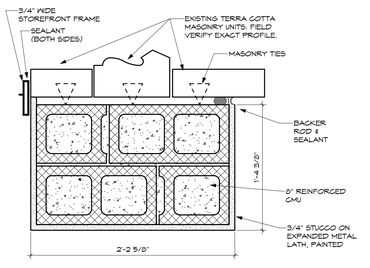
ENTRY WALL SECTION, AT ARCHWAY
9 SCALE: 1" = 1'-0"



ENTRY WALL SECTION, AT SIDE COLUMN
7 SCALE: 1" = 1'-0"

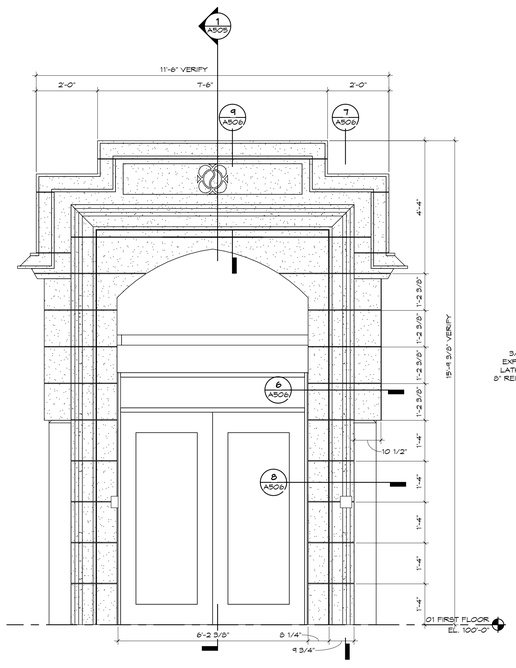


PLAN DETAIL, LOWER
8 SCALE: 1 1/2" = 1'-0"

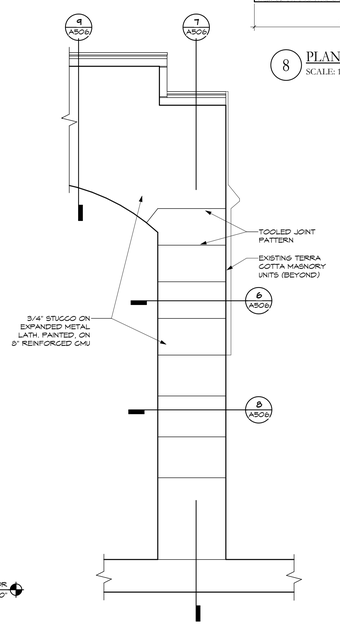


PLAN DETAIL, UPPER
6 SCALE: 1 1/2" = 1'-0"

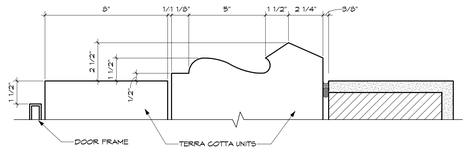
1938 ENTRANCE ARCH PHOTOGRAPH
5 SCALE: N.T.S.



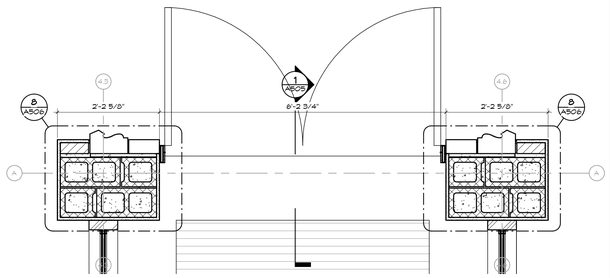
ENLARGED VESTIBULE FACADE ELEVATION
4 SCALE: 1/2" = 1'-0"



VESTIBULE FACADE, BACKSIDE
3 SCALE: 1/2" = 1'-0"



ENLARGED PROFILE
2 SCALE: 3" = 1'-0"



VESTIBULE - FACADE PLAN VIEW
1 SCALE: 3/4" = 1'-0"

SHEET NOTES:

1. TERRA COTTA MASONRY UNITS SALVAGE IN A PREVIOUS PROJECT AND STORED ON SCHOOL DISTRICT CAMPUS. INSTALL SALVAGED TERRA COTTA IN MASONRY WALL, WORKING WITH NEW MASONRY MATERIALS AND COURSING. ASSEMBLE IN SAME CONFIGURATION AS THAT SHOWN ON THE DRAWINGS AND PHOTOGRAPHS TO CREATE A REPLICA OF THE ORIGINAL CONSTRUCTION.
2. NEW FACE BRICK. WORK TO THE SALVAGED TERRA COTTA MASONRY TO CREATE A WELL INTEGRATED ASSEMBLY.
3. NEW ALUMINUM STOREFRONT. FIELD MEASURE NEW OPENING PRIOR TO FABRICATION.
4. POURED-IN-PLACE CONCRETE BASE. PROVIDE A SMOOTH RUBBED FINISH FREE OF VOIDS, BUG HOLES, FORM IMPRESSIONS, AND SIMILAR DEFECTS.
5. CONCRETE STEPS. SEE DETAILS.
6. ANODIZED ALUMINUM RAILING. SEE DETAILS.

GENERAL NOTES:

A. THE RECONSTRUCTION OF THE 1915 AND 1938 ENTRANCE ARCHES ARE INTENDED TO IMMITATE THE ORIGINAL CONTRUCTION OF EACH AS NEARLY AS POSSIBLE.
B. COORDINATE WITH THE OWNER'S REPRESENTATIVE TO RETRIEVE THE STORED TERRA COTTA MASONRY UNITS.
C. REASSEMBLE THE TERRA COTTA IN THE SAME CONFIGURATION AS ORIGINAL CONFIGURATION.
D. ASSEMBLE ARCHES STARTING WITH CENTRAL ARCH FIRST AND INCORPORATING NEW BRICK AND CMU AS IT IS ASSEMBLED. TAKE EVERY PRECAUTION TO ENSURE TERRA COTTA IS POSITIONED CORRECTLY. DRY LAY THE ASSEMBLY FLAT TO CONFIRM NECESSARY MEASUREMENTS BEFORE LAYING IN THE PERMANENT LOCATION.

KEY PLAN:

No.	Revisions / Submissions	Date
1	ADDENDUM #1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

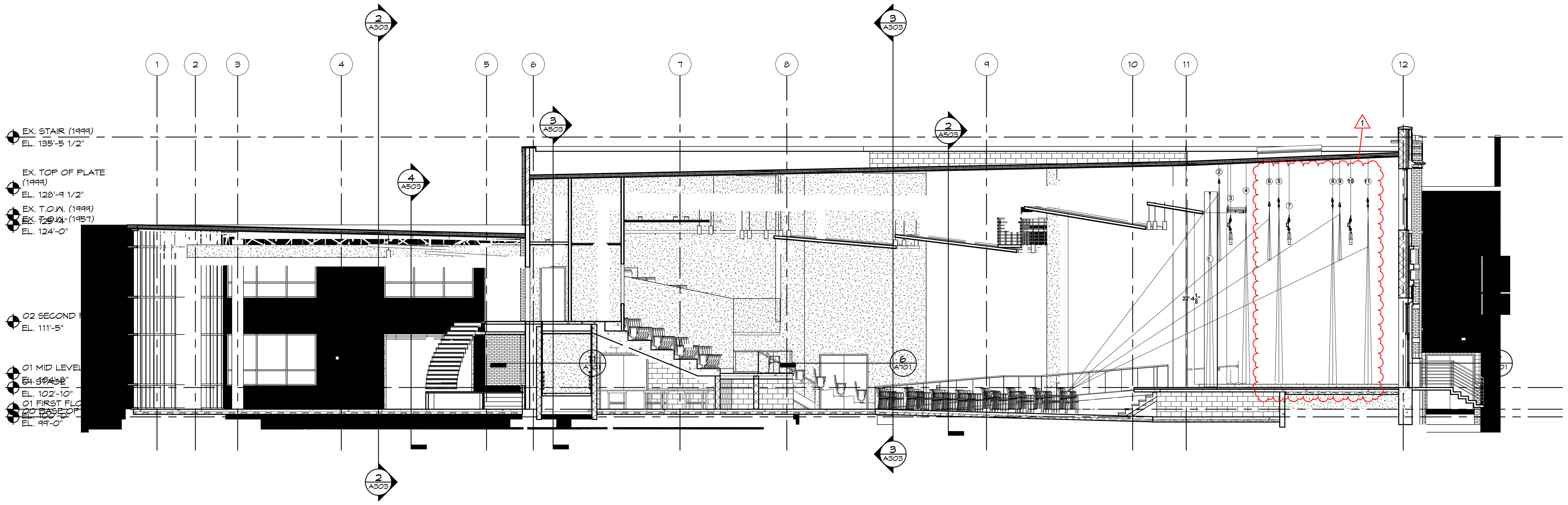
WAYNESVILLE PERFORMING ARTS CENTER

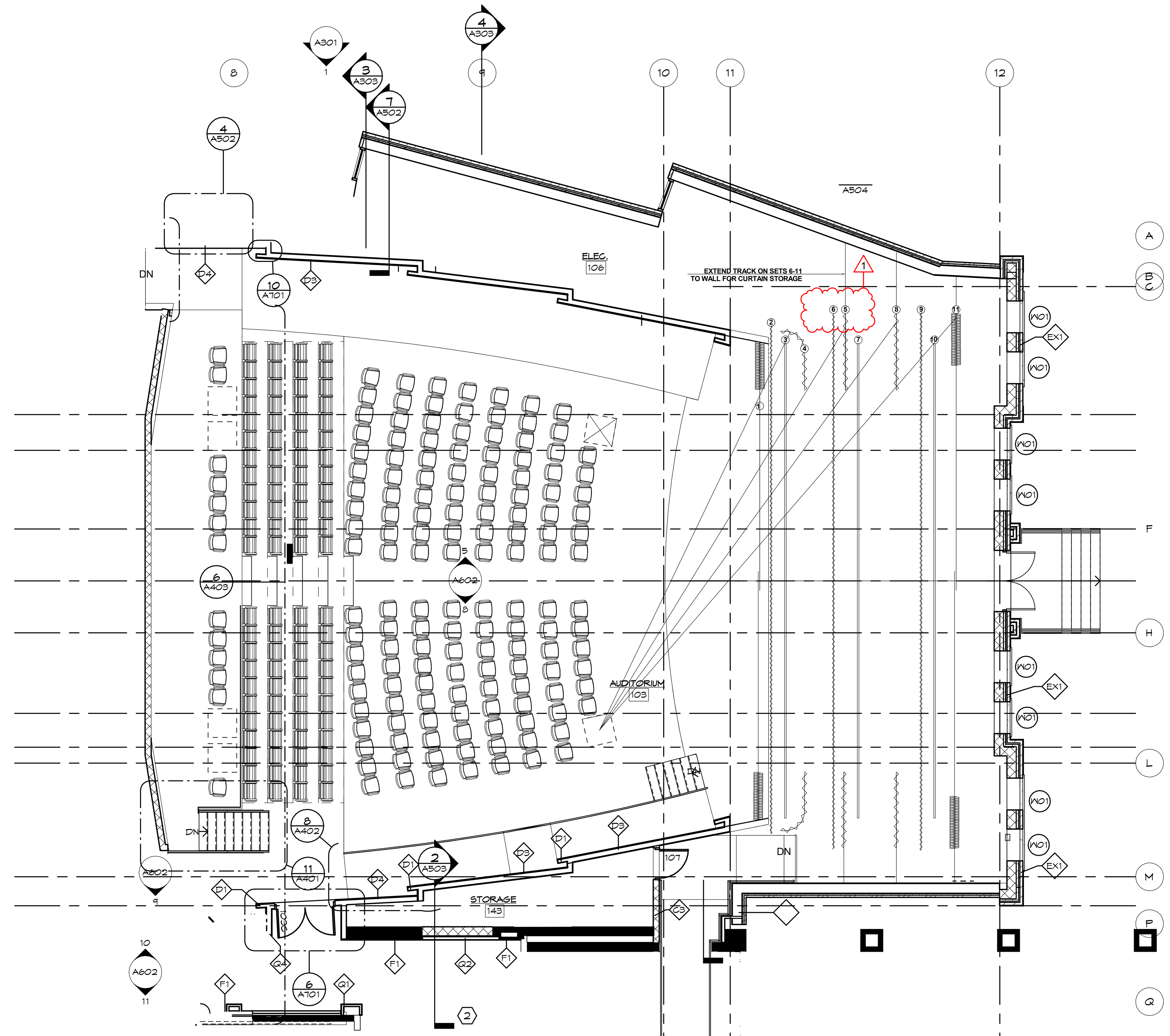
625 DAYTON RD.
WAYNESVILLE, OH 45068

WALL SECTIONS, DETAILS, AND PLAN DETAILS

STATE OF OHIO — JOHN CHARLES FABELO — 71170 — REGISTERED ARCHITECT
JOHN C. FABELO
LICENSE #ARC.9711799, EXPIRES: 12/31/21

Comm. No.	Date
18620.00	2021/03/01
Drawn: PA	Drawing No.: A506
Checked: EGS	





LINESET #	DESCRIPTION	CURTAIN SIZE WIDTH X HEIGHT	FULLNESS	FABRIC TYPE	TRACK MODEL	TRACK LENGTH	PIPE
1	VALANCE	48'-0 x 5'-0"	50%	IFR 24 OUNCE VELOUR	NA	NA	48'0"
2	FRONT CURTAIN	2/30'0" x 14'6"	50%	IFR 24 OUNCE VELOUR	HH 401S	2/30'0"	58'0"
3	1ST ELECTRIC						58'0"
4	1ST LEG	2/8'0" x 14'6"	50%	IFR 15 OUNCE VELOUR	NA	NA	
5	2ND LEG	2/8'0" x 14'6"	50%	IFR 15 OUNCE VELOUR	NA	NA	
6	1ST BORDER	58'-0" x 5'-0"	50%	IFR 15 OUNCE VELOUR	NA	NA	58'0"
7	2ND ELECTRIC						58'0"
8	3RD LEG	2/8'0" x 14'6"	50%	IFR 15 OUNCE VELOUR	NA	NA	
9	2ND BORDER	58'-0" x 5'-0"	50%	IFR 15 OUNCE VELOUR	NA	NA	58'0'
10	3RD ELECTRIC						58'0"
11	REAR CURTAIN	2/30'0" x 14'6"	50%	IFR 15 OUNCE VELOUR	HH 401S	2/30'0"	58'0"

1 AUDITORIUM CURTAINS
SCALE: 1/8" = 1'-0"

SHEET NOTES:

GENERAL NOTES:

KEY PLAN:

No.	Revisions / Submissions	Date
1	ADDENDUM #1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

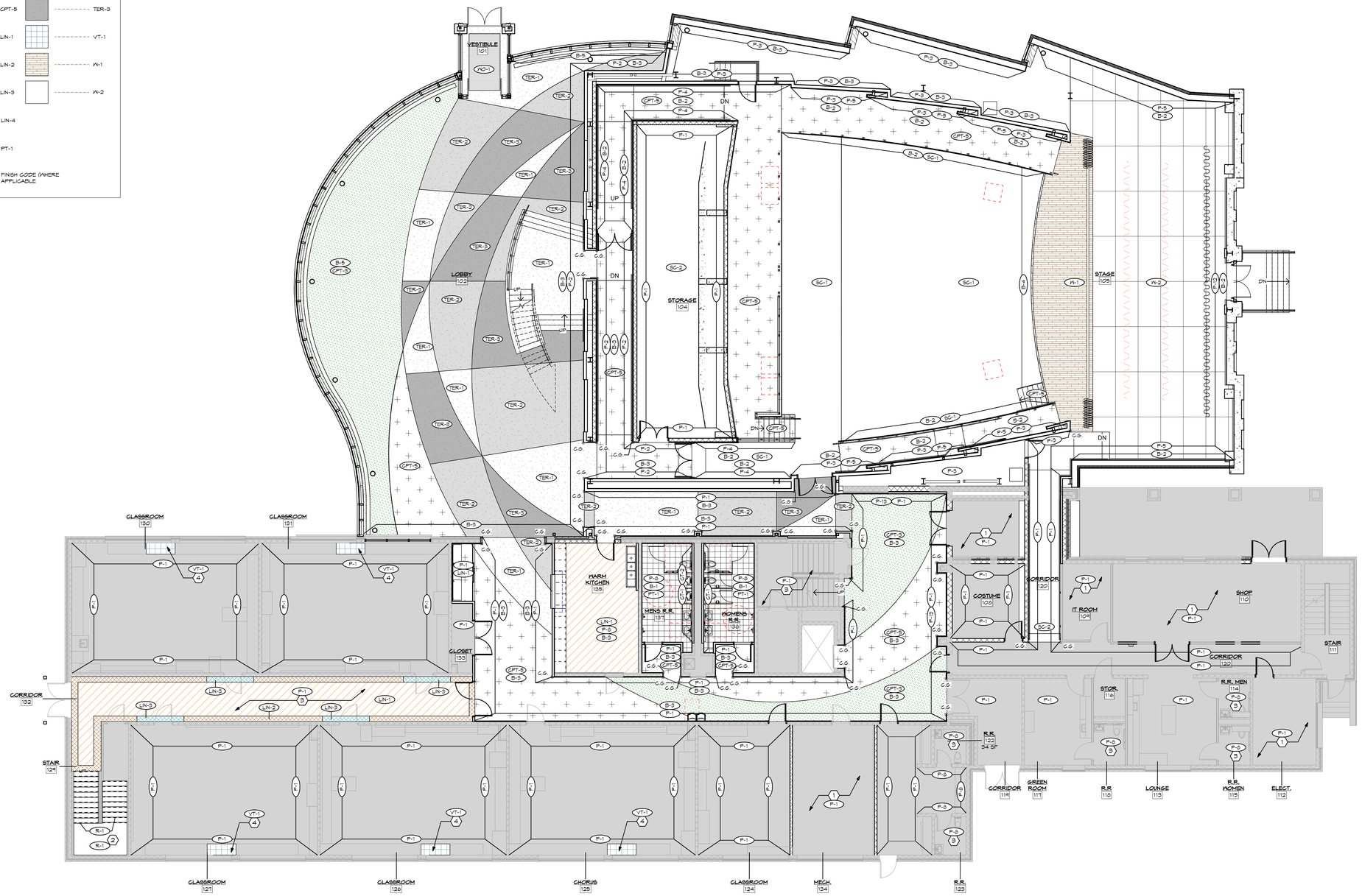
STAGE CURTAIN DETAILS AND SECTIONS

STATE OF OHIO
JOHN CHARLES FABELO
9711799
REGISTERED ARCHITECT
JOHN C. FABELO
LICENSE #ARC.9711799, EXPIRES: 12/31/21

Comm. No. 18620.00
Date 2021/03/01
Drawn PA
Checked EGS
Drawing No. A702

FINISH FLOOR LEGEND

- CPT-1
- CPT-2
- CPT-3
- CPT-5
- LIN-1
- LIN-2
- LIN-3
- LIN-4
- PT-1
- SC
- TER-1
- TER-2
- TER-3
- VT-1
- W-1
- W-2
- P-# — FINISH CODE (WHERE APPLICABLE)



1 FIRST FLOOR FINISH PLAN
SCALE: 1/8" = 1'-0"

SHEET NOTES:

1. PAINT WALLS AND EXPOSED STRUCTURE.
2. NEW RUBBER TREADS, RISERS, AND LANDINGS.
3. PAINT ALL WALLS ABOVE +/- 4'-8" (V.I.F.) HIGH TILE WAINSCOT.
4. PATCH FLOOR COVERING WHERE UNIT VENTILATOR IS REMOVED WITH NEW VINYL TILE TO MATCH EXISTING.

GENERAL NOTES:

A. PAINTING OR FINISHING OF MISCELLANEOUS ITEMS SHALL INCLUDE AND NOT BE LIMITED TO THE FOLLOWING:
   a. HOLLO METAL DOORS, DOOR FRAMES, AND BORROWED LITE FRAMES, RAILING: SEMI-GLOSS.
   b. EXPOSED STEEL STAIR COMPONENTS.
   c. INTERIOR STEEL LINTELS SHALL BE PAINTED THE COLOR OF THE WALL. EXTERIOR LINTELS SHALL BE PAINTED CODE P-? TO MATCH BRICK.
   d. SEE DIVISIONS15 AND 16 OF THE SPECIFICATIONS AND FIRE PROTECTION FOR PAINTING OF MECHANICAL AND ELECTRICAL ITEMS. ALL EXPOSED DUCTWORK, PIPING, CONDUIT, HANGERS, ETC. SHALL BE PAINTED TO MATCH ADJACENT WALL OR CEILING COLOR UNLESS OTHERWISE NOTED.
B. WOOD DOORS ARE TO BE FACTORY FINISHED.
C. SEE INTERIOR FINISH FLOOR PLANS FOR EXTENT OF WALL AND LOORING FINISHES.
D. SOFFIT OR BULKHEAD PAINT TO CONTINUE FROM FACE SIDE(S) TO UNDERSIDE, UNLESS OTHERWISE NOTED.
E. ALL BULKHEAD AND SOFFIT PAINT TO BE EGGSHELL FINISH.
F. TEATHER: FLOORING MATERIALS WHEN TWO TYPES OF MATERIALS JOINT.
G. PAINT GRILLES TO MATCH ADJACENT WALL SURFACE.
H. ALL BASE TO BE FINISH CODE "B-3" UNLESS OTHERWISE NOTED.
I. ALL ACOUSTICAL CEILINGS TO BE FINISH CODE "ACT-1" UNLESS OTHERWISE NOTED.
J. ALL WALLS TO BE PAINT FINISH CODE "P-1" UNLESS OTHERWISE NOTED.
K. ALL WOOD TO RECEIVE STAIN AND TRANSPARENT FINISH.

KEY PLAN:

No.	Revisions / Submissions	Date
1	ADDENDUM #1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

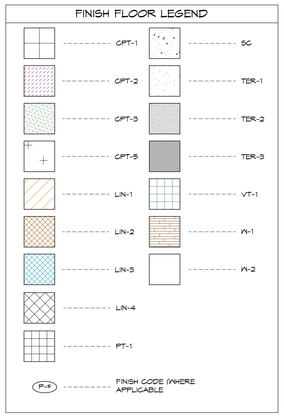
WAYNESVILLE PERFORMING ARTS CENTER

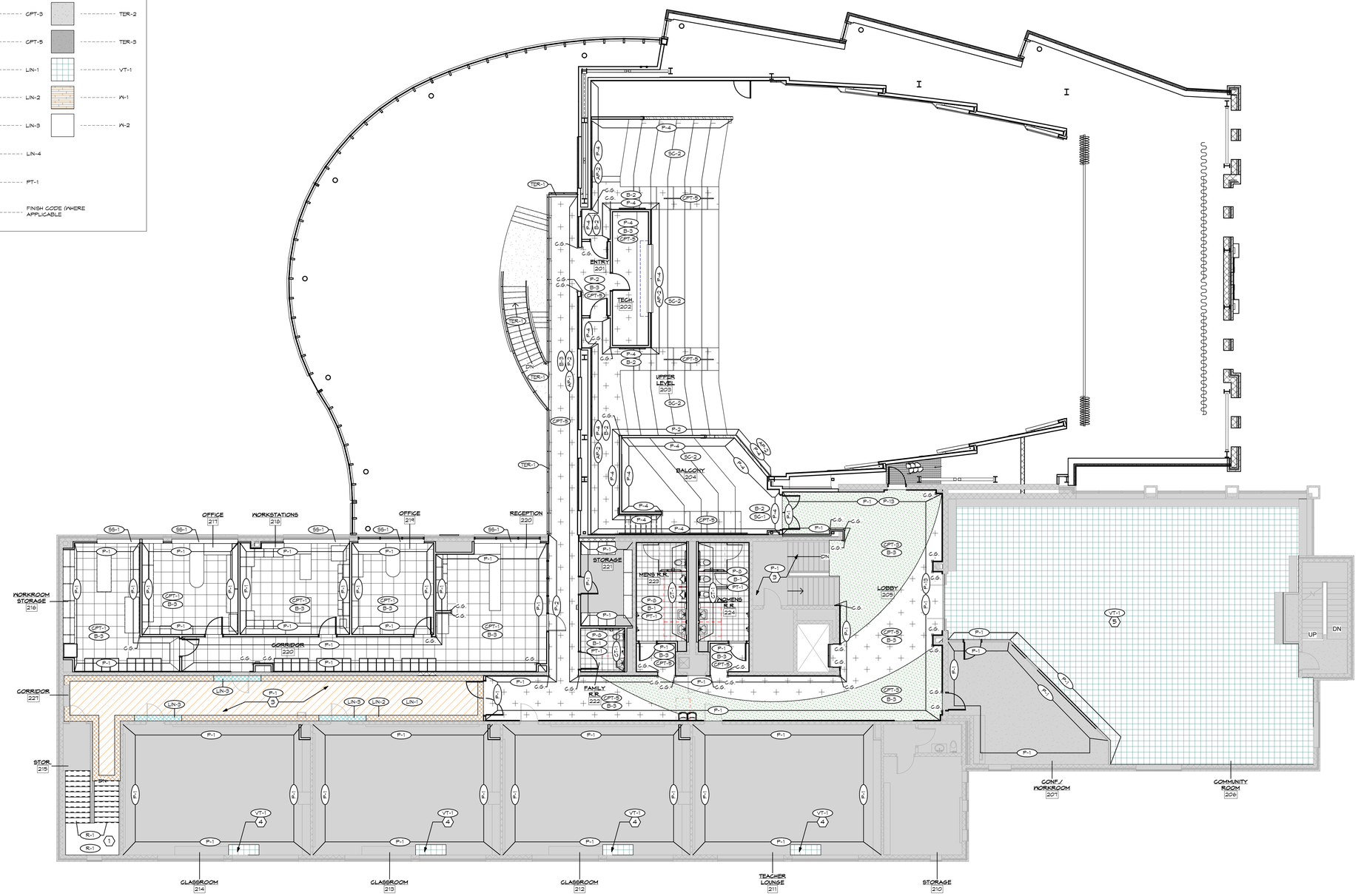
625 DAYTON RD.
WAYNESVILLE, OH 45068

FIRST FLOOR FINISH PLAN

STATE OF OHIO
JOHN CHARLES FABELO
8711799
REGISTERED ARCHITECT
JOHN C. FABELO
LICENSE #ARC.8711799, EXPIRES: 12/31/21

Comm. No.	Date
18620.00	2021/03/01
Drawn: PA	Drawing No.
Checked: EGS	ID101





1 SECOND FLOOR FINISH PLAN
SCALE: 1/8" = 1'-0"

SHEET NOTES:

1. PAINT WALLS AND EXPOSED STRUCTURE.
2. NEW RUBBER TREADS, RISERS, AND LANDINGS.
3. PAINT ALL WALLS ABOVE +/- 4'-8" (V.I.F.) HIGH TILE WAINSCOT.
4. PATCH FLOOR COVERING WHERE UNIT VENTILATOR IS REMOVED WITH NEW VINYL TILE TO MATCH EXISTING.
5. NEW VINYL TILE TO MATCH EXISTING AS AN ALTERNATE FOR LIBRARY.

GENERAL NOTES:

A. PAINTING OR FINISHING OF MISCELLANEOUS ITEMS SHALL INCLUDE AND NOT BE LIMITED TO THE FOLLOWING:
   a. HOLLO METAL DOORS, DOOR FRAMES, AND BORROWED LITE FRAMES, RAILING. SEMI-GLOSS.
   b. EXPOSED STEEL STAIR COMPONENTS.
   c. INTERIOR STEEL LINTELS SHALL BE PAINTED THE COLOR OF THE WALL. EXTERIOR LINTELS SHALL BE PAINTED CODE P-? TO MATCH BRICK.
   d. SEE DIVISIONS15 AND 16 OF THE SPECIFICATIONS AND FIRE PROTECTION FOR PAINTING OF MECHANICAL AND ELECTRICAL ITEMS. ALL EXPOSED DUCTWORK, PIPING, CONDUIT, HANGERS, ETC. SHALL BE PAINTED TO MATCH ADJACENT WALL OR CEILING COLOR UNLESS OTHERWISE NOTED.
B. WOOD DOORS ARE TO BE FACTORY FINISHED.
C. SEE INTERIOR FINISH FLOOR PLANS FOR EXTENT OF WALL AND LOORING FINISHES.
D. SOFFIT OR BULKHEAD PAINT TO CONTINUE FROM FACE SIDE(S) TO UNDERSIDE, UNLESS OTHERWISE NOTED.
E. ALL BULKHEAD AND SOFFIT PAINT TO BE EGGSHELL FINISH.
F. 'FEATHER' FLOORING MATERIALS WHEN TWO TYPES OF MATERIALS JOINT.
G. PAINT GRILLES TO MATCH ADJACENT WALL SURFACE.
H. ALL BASE TO BE FINISH CODE "B-3" UNLESS OTHERWISE NOTED.
I. ALL ACOUSTICAL CEILINGS TO BE FINISH CODE "ACT-1" UNLESS OTHERWISE NOTED.
J. ALL WALLS TO BE PAINT FINISH CODE "P-1" UNLESS OTHERWISE NOTED.
K. ALL WOOD TO RECEIVE STAIN AND TRANSPARENT FINISH.

KEY PLAN:

No.	Revisions / Submissions	Date
1	ADDENDUM #1	3/15/2021

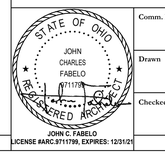
LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

SECOND FLOOR FINISH PLAN



JOHN C. FABELO
LICENSE #ARC.8711799, EXPIRES: 12/31/21

Comm. No.	Date
18620.00	2021/03/01
Drawn: PA	Drawing No.: ID102
Checked: EGS	

Date: 3/15/2021
Project Name: Waynesville Performing Arts
Addendum 1

This Addendum is generally separated into sections for convenience; however, all contractors, subcontractors, material suppliers and other involved parties shall be responsible for reading the entire Addendum. Failure to list an item(s) in all affected sections of this Addendum does not relieve any party affected from performing per instructions, provided the information is set forth one time anywhere in the Addendum.

This document shall become attached to and part of the construction documents for the aforementioned project.

CLARIFICATIONS AND **MODIFICATIONS TO THE PROJECT DOCUMENTS:**

RFI's from Contractors:

ITEM 01 Question – Can you please clarify if the use of MC cable is allowed?
CMTA Response - Provide alternate deduce pricing to utilize MC vs conduit in walls and above ceiling space. This is going to be very limited due to the open structure of the theater. No MC cable will be allowed in the open areas exposed to public, catwalk, stage.

ITEM 02 Question - In spec section 260501 1.22 D. there is a requirement that all work be completed exclusively by journeyman electricians. I imagine this is a mistake, but would like that clarified.
CMTA Response – Delete the following paragraph in it's entirely – 260501, 1.22,D.

ITEM 03 DP & L (AES Ohio) contact is Luis Perez – (937) 780-5503.

ITEM 04 Question – F102 & F104 shown as an Alternate Plan – is there a particular "Alternate" that this is applicable to?
CMTA Response – The alternate refers to Rooms 130/131 and 124/125 on F102 and Rooms 211/212 on F104. Sprinkler head layout should reflect these rooms as combined rooms as shown. Clarification of the alternate bounds will be provided in Addendum 1 drawings.

ITEM 05 Questions - The required bid breakouts include the following items that are indicated to be OFOI in the responsibility matrix on drawing E000:

- Access Control
- CATV
- Security
- Video Surveillance

222 E. 14th Street, Fourth Floor | Cincinnati, OH 45202 | 513.429.4404 | cmta.com
MEP Engineering | Performance Contracting | Zero Energy Engineering | Technology | Commissioning

Please confirm who is providing those systems

CMTA Response – These Systems are provided under a Separate Contract. (Not included in this project) Rough-in and Power as indicated on the drawings and specifications are part of this project.

ITEM 06 Questions - The required bid breakouts include the following items that are not shown on the drawings, or included in the specifications:

- Generator
- Automatic Transfer Switches
- Startup on both of the above

Are these items to be included on the project?

CMTA Response – These systems are not included in this project.

ITEM 07 Questions - Owner training is also required for the following systems in 260501 1.52 (E):

- Access Controls
- CATV
- Security
- Video Surveillance

If these systems are not to be provided or installed under this bid pack can they be excluded?

CMTA Response – These Systems are provided under a Separate Contract. (Not included in this project)

ITEM 08 Questions - The scope of work at spec section 260502 1.2 includes the following items:

- Emergency generator and Automatic Transfer switches
- Security System

Can these items be omitted?

CMTA Response – YES, these systems are not included in this project.

ITEM 09 Questions - The scope of work at spec section 260502 1.2 includes inspections and fees for all DIv 26, 27, and 28 systems. Can OFOI systems be removed from this requirement?

CMTA Response – Yes, With the exception of Fire Alarm and the Sound Systems Included in the Project.

ITEM 10 Questions - The scope of work at spec section 260502 1.2 (28) requires pre-certification of the fire alarm system as well as security and sound systems. What is this pre-certification to include? What type of testing is required? Do individual components need to be tested prior to install? Is this a requirement for engineering or AHJ approval?

CMTA Response – Remove all references to pre-certification of the fire alarm systems.

ITEM 11 Questions - Burial depths listed in spec section 260505 significantly exceed code minimums as well as the depths shown on drawing E602. Which burial depths are to be used?

CMTA Response – Install conduit depths per specifications.

ITEM 12 Questions - Who is the manufacturer of the existing campus wide fire alarm system?

CMTA Response – the fire alarm for this building is a new stand-alone system with 2 telephone lines 1 land and 1 cell.

ITEM 13 Questions - Will this existing system be permitted to receive only alarm, trouble, or supervisory from the new fire alarm control panel in the new Performing Arts Center?

CMTA Response – the fire alarm for this building is a new stand-alone system, not tied into or connected to the other buildings. These systems won't be connected.

SPECIFICATIONS

ITEM 01 Spec 26 55 61 – Theatrical Stage Lighting
- Replace this spec section in it's entirety with the attached.

ITEM 02 Spec 26 05 01 – General Provisions – Electrical
- Delete the following paragraph in it's entirely – 260501, 1.22,D.

ITEM 02 Spec 23 74 16 – Packaged Rooftop Air Conditioning Units
- Revised minimum cabinet R-Value to 13.0.
- Revised casing insulation thickness to 2 inch.
- Removed vandal protection, added hail protection requirement.

ITEM 03 Spec 23 74 13 – Packaged Dedicated Outdoor Air Unit
- Revised minimum cabinet R-Value to 13.0.

222 E. 14th Street, Fourth Floor | Cincinnati, OH 45202 | 513.429.4404 | cmta.com
MEP Engineering | Performance Contracting | Zero Energy Engineering | Technology | Commissioning

- Revised unit return location to be bottom.
- Digital scroll (variable capacity) compressors shall not be acceptable. See Part 2 Section E.
- Revised gas capacity modulation requirement to 12:1.
- Added “Dampers” section.
- Added “Roof Curbs” section.
- Clarified that unit needs to have single point power connection. Removed panel SCCR rating.
- Added Reznor as an acceptable manufacturer.

ITEM 04 Spec 23 12 00 – Sheet Metal

- Updated Part 2, Section 2.21. Where a minimum 12”x12” square access door won’t fit to service a fire/smoke/motorized damper, a removable duct section shall be installed in accordance with NFPA 80.

DRAWINGS

ITEM 01 Refer to sheet attached drawing sheet E600:

1. Refer to Luminaire Schedule
    a. Refer to fixture type FL1 - Add following to the lumen output 18,520 and 132.6 to the watts. Aim fixtures in field.
    b. Refer to fixture type W4E – change basis of design to Hubbell – RWL1-48L-25-4K7-4W-UNV-X 2,680 lumens, and 28 watts. Color selected by architect. This is change is to match the new elementary school fixtures no equals.
    c. Refer to fixture type P1 – change basis of design to Hubbell – RAR-1160L-100-4K7-5QW-UNV. Color selected by architect. This is change is to match the new elementary school fixtures no equals.
    d. Added the following as approved equals:
        i. Types A2, A2D, A2E – Daybrite-2-FGEZ-G
        ii. Type A5 – Daybrite-2-CT-G
        iii. Type C1 – SSL-SSC10-17
        iv. Type C2 and C2E – SSL-SSC6i
        v. Types D3, D3E, D4, D5, D6, D6E – Daybrite-6R-N
        vi. Type F4 – Daybrite-2SB
        vii. Type FL1 – no equals matching existing
        viii. Type TB – Novaflexled – NF-RGBW
        ix. Type W4E – no equals matching existing
        x. Type P1 - no equals matching existing
        xi. Type W5 – Stonco-VWXL
        xii. Types EX1 and EX2 – Chloride - CLX
        xiii. Types K1 and K1E – Daybrite -FSS
        xiv. Types L10F, L11, L12, L13, L16, L17F, L26 – Ledalite-39
        xv. Types W3 and W3E – Finelite-HP-2-P
        xvi. Type TH2 – Chauvet Professional - Colorado Solo3
        xvii. Type TH4 – Chauvet Professional - Ovation E-910FC
        xviii. Type TH5- Chauvet Professional - Ovation E-910FC

ITEM 02 Refer to sheet attached drawing sheet M501:

222 E. 14th Street, Fourth Floor | Cincinnati, OH 45202 | 513.429.4404 | cmta.com
MEP Engineering | Performance Contracting | Zero Energy Engineering | Technology | Commissioning

1. Updated exhaust fan sequence of operation.
2. Included points list for BAS integration of existing packaged RTU. Contractor to verify integration is possible with existing unit controls or provide new if required.

ITEM 03 Refer to sheet attached drawing sheet M103:

1. Fixed technical glitch where tagged note MD14 text was not appearing in list.

ITEM 04 Refer to sheet attached drawing sheets F102 & F104:

1. Removed hatching not effected by wall removal alternate.
2. Removed base bid tagged notes.

SECTION 231200 - SHEET METAL

PART 1 – GENERAL:

1.1 The Contractor's attention is directed to the General and Special Conditions, GENERAL PROVISIONS - MECHANICAL and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section and which are hereby made a part of the work specified in this section.

1.2 This branch of the work includes all materials, labor and accessories for the fabrication and installation of all sheet metal work as shown on the drawings and/or as specified herein. Where construction methods for various items are not indicated on the drawings or specified herein, all such work shall be fabricated and installed in accordance with the recommended methods outlined in the latest edition of SMACNA's Duct Manual and Sheet Metal Construction for Low Velocity Ventilating and Air Conditioning Systems. All equipment furnished by manufacturers shall be installed in strict accord with their recommended methods.

1.3 Ductwork shall be constructed and installed per the latest edition of the International Mechanical Code.

1.4 Ductwork shall be kept clean at all times. Ductwork stored on the job site shall be placed a minimum of 4" above the floor and shall be completely covered in plastic. Installed ductwork shall be protected with plastic. Do not install the ductwork if the building is not "dried-in". If this is required, the entire lengths of duct shall be covered in plastic to protect. The Owner/Engineer shall periodically inspect that these procedures are followed. If deemed unacceptable, the Contractor shall be required to clean the duct system utilizing a NADCA certified Contractor.

1.5 Prior to purchase and fabrication of ductwork (shop fabricated or manufactured), the Contractor shall coordinate installations with new and existing conditions. Notify the Engineer if there are any discrepancies for resolution.

1.6 For healthcare projects, provide a SMACNA duct cleanliness level "C" per the latest SMACNA standards.

PART 2 – LOW VELOCITY DUCTWORK:

2.1 Ductwork, plenums and other appurtenances shall be constructed of one of the following: Steel sheets, zinc coated, Federal Specification 00-S-775, Type I, Class E & ASTM A93-59T with G-90 zinc coating. Aluminum alloy sheets 3003, Federal Specification AA-A-359, Temper H-14. Utilize Aluminum in MRI Scan Rooms.

2.2 Ductwork, plenums and other appurtenances shall be constructed of the materials of the minimum weights or gauges as required by the latest SMACNA 2" W.G. Standard or below table. When gauge thickness differs, the heavier gauge shall be selected. The below table shall serve as a minimum.

Round Diameter	Duct Gauge	Rectangular Width	Duct Gauge
3-12 Inches	26 Ga.	3-12 inches	26 Ga,
12-18 Inches	24 Ga.	13-30 inches	24 Ga.
19-28 Inches	22 Ga.	31-54 inches	22 Ga.
29-36 Inches	20 Ga.	55-84 inches	20 Ga.
37-52 Inches	18 Ga.	85 inches and up	18 Ga.

2.3 All ductwork connections, fittings, joints, etc., including longitudinal and transverse joints, seams and connections shall be sealed. Seal with high velocity, smooth-textured, water based duct sealant. Sealant shall be UL 181B-M listed, UL 723 classified, NFPA 90A & 90B compliant, permanently flexible, non-flammable, and rated to 15"wg. Apply per manufacturer's recommendations. Contractors shall insure no exposed sharp edges or burrs on ductwork.

2.4 Duct dimensions indicated are required inside clear dimensions. Plan duct layouts for adequate insulation and fitting clearance.

2.5 All angular turns shall be made with the radius of the center line of the duct equivalent to 1.5 times the width of the duct.

2.6 Cross-break all ducts where either cross sectional dimension is 18" or larger.

2.7 Ducts shall be hung by angles, rods, 18 ga. minimum straps, trapezes, etc., in accordance with SMACNA's recommended practices. Duct supports shall not exceed 12 ft intervals. There shall be no less than one set of hangers for each section of ductwork. Where ductwork contains filter sections, coils, fans or other equipment or items, such equipment or items shall be hung independently of ductwork with rods or angles. Do not suspend ducts from purlins or other weak structural members where no additional weight may be applied. If in doubt, consult the Structural Engineer.

2.8 Double turning vanes shall be installed in square turns and/or where indicated.

2.9 Provide a “high efficiency” type take-off with round damper (Flexmaster STOD-B03 or approved equal) for all round duct branches from a rectangular main to a GRD. Refer to the detail on the drawings for all installation requirements.

2.10 Air volume dampers shall be installed in each duct branch takeoffs and/or where indicated, whichever is more stringent. All such dampers shall be accessible without damage to finishes or insulation and shall be provided where required for proper system balance.

2.11 Unless otherwise dimensioned on the drawings, all diffusers, registers and grilles shall be located aesthetically and symmetrically with respect to lighting, ceiling patterns, doors, masonry bond, etc. Locate all supply, return and exhaust diffusers and grilles in the locations shown on the architectural reflected ceiling plan.

2.12 The interior surface of the ductwork connecting to return/exhaust air grilles shall be painted flat black. The ductwork shall be painted a minimum of 24" starting from the grille.

2.13 Provide approved flexible connectors at inlet and outlet of each item of heating and cooling equipment whether indicated or not. Install so as to facilitate removal of equipment as well as for vibration and noise control.

2.14 All fans and other vibrating equipment shall be suspended by independent vibration isolators.

2.15 Miscellaneous accessories such as test openings with covers, latches, hardware, locking devices, etc., shall be installed as recommended by SMACNA and/or as indicated. Test openings shall be placed at the inlet and discharge of all centrifugal fans, VAV boxes, fan sections of air handling units, at the end and middle of all main trunk ducts and where indicated. All such openings shall be readily accessible without damage to finishes.

2.16 Whether indicated or not, provide code approved, full sized fire dampers at all locations where ductwork penetrates fire rated walls. Fire stop rating shall meet or exceed the rating of the wall. Provide an approved access panel at each fire damper located and sized so as to allow hand reset of each fire dampers. All such fire dampers and access panels shall be readily accessible without damage to finishes. Refer to Architectural Plans for locations of fire rated walls. All access doors shall be 16"x16" or as high as ductwork permits and 16" in length.

2.17 The Contractor who installs the sheet metal shall furnish to the Air Balancing Contractor, a qualified person to assist in testing and balancing the system.

2.18 INSULATED FLEXIBLE AIR DUCT: Thermaflex G-KM or equal. Flexible air duct shall be two (2) inch thick fiberglass insulation with CPE liner permanently bonded to a coated spring steel wire helix supporting a fiberglass scrim and fiberglass insulating blanket. Flexible air duct shall be listed under UL Standard 181 as a Class I flexible air duct complying with NFPA 90A and 90B. Maximum flame spread = 25 and maximum smoke developed = 50. Minimum insulating value is R-6.0. Flexible duct shall be used only for GRD runouts and no section shall be more than five feet in length.

2.19 FLEXIBLE CONNECTORS: Duro-Dyne, Ventfabrics, Inc., U.S. Rubber or equivalent; conforming to NFPA No. 90A; neoprene coated glass fabric; 20 oz. for low velocity ducts secured with snap lock.

2.20 TURNING VANES: Fabricated as recommended by SMACNA: noiseless when in place without mounting projections in ducts. All turning vanes shall be double blade type.

2.21 ACCESS DOORS IN DUCTWORK: Flexmaster TBSM, Air Balance, Vent Products or equal. Access doors for rectangular ducts shall be 16"x16" where possible. Otherwise install as large an access door as height permits by 16" in length. Door shall be 2" thick double-wall insulated with continuous hinge and cam lock. Provide in ducts where indicated or where required for servicing equipment whether indicated or not. Provide a hinged access door in duct adjacent to all fire, smoke and control dampers for the purpose of determining position. Where a minimum of 12"x12" square access door won't fit adjacent to a fire, smoke or control damper, a removable duct section shall be installed in accordance with NFPA 80. Access doors shall also be provided on each side of duct coils and downstream side of VAV boxes and CAV boxes.

2.22 ARCHITECTURAL ACCESS DOORS IN CEILINGS OR WALLS: Provide Kees D Panel, Cesco, Milcor or equal. Panels shall be 24"x24" in size and constructed with 16 gauge galvannealed steel for door and frame. Provide with primer finish to accept specified finish. Door shall include three (3) screwdriver operated cam latches and concealed continuous pivoting rod hinge. Door shall open 175 degrees. For masonry construction, furnish frames with adjustable metal masonry anchors. For fire rated units, provide manufacturer's standard insulated flush panel/doors with continuous piano hinge and self-closing mechanism. The Contractor shall include all required access doors in the bid and shall coordinate with the General Contractor prior to the bid to insure a complete project.

2.23 VOLUME DAMPERS (RECTANGULAR): Ruskin MD35 or Air Balance, Pottorff, rectangular volume dampers. Frames shall be 16 gauge galvanized steel. Blades shall be opposed blade 16 gauge galvanized steel with triple crimped blades on 6" centers. Linkage shall be concealed in jamb. Bearings shall be ½" nylon. Maximum single section size shall be 48" wide and 72" high. Provide with Ventfabrics 2" high elevated dial regulator to avoid damper handle from conflicting with duct insulation. Provide permanent mark on dial regulator to mark air balance point.

2.24 VOLUME DAMPERS (ROUND): Ruskin MDRS25 or Air Balance, Pottorff round volume dampers. Dampers shall be butterfly type consisting of circular blade mounted to axle. Frames shall be 20 gauge steel and 6" long. Damper blades shall be 20 gauge crimped galvanized steel. Axle shall be 3/8"x6" square plated steel. Bearing shall be 3/8" nylon. Provide with Ventfabrics 2" high elevated dial regulator to avoid damper handle from conflicting with duct insulation. Provide permanent mark on dial regulator to mark air balance point.

2.25 FIRE DAMPERS: Fire dampers shall be Ruskin 1BD2 1½ hour rating U-215B vertical 1½ hour rating or United Air Type U-255B for a 3 hour vertical rating. Other acceptable manufacturers are Air Balance or Pottorff. Fire dampers shall be constructed and tested in accordance with UL Safety Standard 555. Each fire damper shall have a 1½ or 3 hour fire protection rating as required by fire wall. Damper shall have a 165 degrees F fusible link, and shall include a UL label in accordance with established UL labeling procedures. Fire damper shall be equipped for vertical or horizontal installation as required by the location shown. Fire dampers shall be installed in wall and floor openings utilizing minimum 20 gauge steel sleeves, angles, other materials, practices required to provide an installation to that utilized by the manufacturer when dampers were tested at UL. Blade and frame thickness shall be a minimum of 24 gauge. Installation shall be in accordance with the damper manufacturer's instructions. The blades shall be

out of the air stream. Provide an access door for fire damper reset at all fire damper locations. Provide factory supplied caulked sleeve, gauge as required to meet manufacturer UL installation requirements.

PART 3 – HIGH VELOCITY DUCTWORK:

3.1 High velocity ductwork shall be utilized for all supply ductwork between air handling units and VAV/CAV boxes. Provide Eastern Sheet Metal Model "CB" or equal takeoff fitting for each VAV/CAV off high velocity main. Shop or field fabricated takeoffs are not acceptable. Straight tees are not allowed.

3.2 Prior to purchase/shipment of the ductwork, manufacturer shall provide as part of the submittal process scaled, field coordinated Autocad drawings of the complete system to be furnished. Drawings will indicate all system components including fittings, ductwork and manifolds. Drawings shall be available in an electronic format.

3.3 All round and oval high velocity ductwork for systems above 1.5" W.G. shall be Eastern Sheet Metal, United McGill or Semco or equal as required by the latest SMACNA 10" W.G. Standard.

3.4 Ductwork shall be spiral, lock-seam construction fabricated from galvanized steel meeting ASTM-527 standard. Any ductwork exposed to view shall be constructed of galvanized steel. Galvanized metal shall be prepped and clean prior to painting. Coordinate with General Contractor. Ductwork shall be constructed of the following minimum gauges:

Round Diameter	Duct Gauge	Flat Oval Major Axis	Duct Gauge
3-14 Inches	26 Ga.	10-24 inches	24 Ga,
15-26 Inches	24 Ga.	25-48 inches	22 Ga.
27-36 Inches	22 Ga.	49-71 inches	20 Ga.
37-50 Inches	20 Ga.	71 inches and up	18 Ga.
52-84 Inches	18 Ga.		

3.5 All high velocity duct fittings shall be fabricated by the same manufacturer as the spiral pipe. Contractor or field fabricated fittings shall not be accepted. Duct fittings shall be constructed per the latest SMACNA 10" WG standard with continuous welds. Take-off fittings shall be combination type tees (Eastern Sheet Metal Model "CB" or equal). Straight or angle tees are not acceptable. Fittings shall be constructed of the following minimum gauges.

Round Diameter	Duct Gauge	Flat Oval Major Axis	Duct Gauge
3-50 Inches	20 Ga.	10-36 inches	20 Ga.
52-60 Inches	18 Ga.	37-60 inches	18 Ga.
61-84 Inches	16 Ga.	71 inches and up	16 Ga.

3.6 All single wall ductwork will be furnished with factory installed flanges equal to Eastern Sheet Metal Flange on all ductwork greater than 24 inches in size.

3.7 Duct dimensions indicated are required inside clear dimensions.

3.8 All ductwork connections, fittings, joints, etc., shall be sealed. Seal with high velocity, smooth-textured, water based duct sealant. Sealant shall be UL 181B-M listed, UL 723 classified, NFPA 90A & 90B compliant, permanently flexible, non-flammable, and rated to 15"wg. Apply per manufacturer's recommendations.

3.9 Ductwork shall be installed per the latest SMACNA Medium or High Pressure Manual, whichever is applicable.

3.10 All hanger straps shall be 18 ga. minimum with reinforcement angles installed in strict accordance with SMACNA. Flat oval ducts shall be installed with 2"x2"x¼" angles on top and bottom ducts 18" wide and larger. Use 1"x1"x3/16" angles on ducts under 18" wide.

3.11 Miscellaneous accessories such as test openings with covers, latches, hardware, locking devices, etc., shall be installed as recommended by SMACNA or the duct manufacturer, and/or as indicated. Test openings shall be placed at the discharge of all air handling units and at the end and middle of all main trunk ducts and where indicated. All such openings shall be readily accessible without damage to finishes.

3.12 Whether indicated or not, provide code approved, full sized fire dampers at all locations where ductwork penetrates fire rated walls. Fire stop rating shall meet or exceed the rating of the wall. Provide an approved access panels at each fire damper located and sized so as to allow hand reset of each fire damper. All such fire dampers and access panels shall be readily accessible without damage to finishes. Refer to Architectural Plans for locations of fire rated walls. Where access doors are installed in insulated ductwork, the access door shall be the insulated type.

3.13 FLEXIBLE CONNECTORS: Duro-Dyne, Ventfabrics, Inc., U.S. Rubber or equivalent; conforming to NFPA No. 90A; neoprene coated glass fabric. Provide flexible connectors at inlet and outlet of air handling equipment to accommodate a minimum of three times the operating pressure of the system.

3.14 PRESSURE RELIEF DOORS: Provide a pressure relief door in the supply air ductwork at each air handling unit. It shall be located where shown on the drawings. It shall be sized to relieve the duct air pressure below the rated pressure construction of the ductwork and above the working pressure of the fan. The supply air relief door shall be Ruskin PRD18 or equal. Provide a vacuum relief door in the return air ductwork at each return air fan. It shall be located where shown on the drawings. It shall be sized to relieve the duct vacuum below the rated construction of the ductwork and above the working negative pressure of the fan. The return air relief door shall be Ruskin NRD18 or equal. Automatic fan shutdown upon damper closure shall not be an acceptable protection for either overpressure or vacuum conditions. All duct relief dampers shall be of the automatic resetting type.

3.15 ARCHITECTURAL ACCESS DOORS IN CEILINGS OR WALLS: Provide Kees D Panel, Cesco, Milcor or equal. Panels shall be 24”x24” in size and constructed with 16 gauge galvannealed steel for door and frame. Provide with primer finish to accept specified finish. Door shall include three (3) screwdriver operated cam latches and concealed continuous pivoting rod hinge. Door shall open 175 degrees. For masonry construction, furnish frames with adjustable metal masonry anchors. For fire rated units, provide manufacturer’s standard insulated flush panel/doors with continuous piano hinge and self-closing mechanism. The Contractor shall include all required access doors in the bid and shall coordinate with the General Contractor prior to the bid to insure a complete project.

3.16 ACCESS DOORS; IN DUCTWORK: All access doors in round or oval high velocity ductwork shall be screw and gasketed type. Screws shall be maximum 4 inches on centers.

DUCT DIAMETER	OPENING SIZE
3-4 inches	4"x10"
5-6 inches	6"x10"
7-24 inches	10"x16"
26-36 inches	16"x16"
Over 36 inches	16"x22"

3.17 FIRE DAMPERS: Fire dampers shall be Ruskin 1BD2 1½ hour rating U-215B vertical 1½ hour rating or United Air Type U-255B for a 3 hour vertical rating. Other acceptable manufacturers are Air Balance or Pottorff. Fire dampers shall be constructed and tested in accordance with UL Safety Standard 555. Each fire damper shall have a 1½ or 3 hour fire protection rating as required by fire wall. Damper shall have a 165 degrees F fusible link, and shall include a UL label in accordance with established UL labeling procedures. Fire damper shall be equipped for vertical or horizontal installation as required by the location shown. Fire dampers shall be installed in wall and floor openings utilizing minimum 20 gauge steel sleeves, angles, other materials, practices required to provide an installation equipment to that utilized by the manufacturer when dampers were tested at UL. Blade and frame thickness shall be a minimum of 24 gauge. Installation shall be in accordance with the damper manufacturer's instructions. The blades shall be out of the air stream. Provide an access door for fire damper reset at all fire damper locations. Provide factory supplied caulked sleeve, gauge as required to meet manufacturer UL installation requirements.

PART 4 – WATER HEATER FLUE STACKS:

4.1 TYPE “B” GAS VENT SYSTEM

4.1.1 Metalfab Type "M", Ampco, or Metalbestos Type "B" gas vent system. Gas vent shall be double wall construction. Inner wall shall be aluminum and outer wall galvanized steel. One-half inch insulating air space shall be provided between the walls. Gas vent system shall be UL listed and installed in strict accordance with the manufacturer's recommendations. Provide with factory fittings such as elbows, tees, tee cap, cap, tall cone flashing, support plate increaser etc., as required for a complete project. Shop drawings shall be submitted for Engineer's review. Minimum UL listed clearance to combustibles shall be one inch.

END OF SECTION 231200

SECTION 237413 - PACKAGED DEDICATED OUTDOOR AIR UNIT

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. Section Includes:

1. Packaged energy recovery units with the following energy recovery device:
   a. Wheel Enthalpic Exchanger
2. Packaged Cooling
3. Packaged Heating
4. Packaged Controls

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include all rated capacities at scheduled design conditions, operating characteristics, general product features, options and accessories, controls, pre-programmed controls sequences, all end devices, and unit warranties provided.

B. Shop Drawings: For air-to-air energy recovery equipment, include plans, elevations, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, corner weights, required clearances, components, and location and size of each field connection.

C. Factory start-up, inspection, and check-out reports to be provided to engineer for review prior to final equipment acceptance, startup, or commissioning. See section 2.2 for more information.

D. Operation and Maintenance Data to be provided with unit at shipment including Mechanical O&M and Controls Instructions and O&M.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1-2013, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Startup."
2. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2013.
3. ASHRAE 90.1 and EER and IEER and COP requirements

C. ANSI Z83.8 and CSA 2.6 standards for gas fired equipment

D. UL Compliance:

1. Unit shall be ETL listed per UL standard 1995 and CSA standard C22.2 #236

1.5 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with equipment provided.

B. Coordinate sizes and locations of concrete bases with equipment provided.

C. Coordinate locations of connecting utilities including: water, gas, electric, controls, and condensate with equipment provided.

1.6 DELIVERY AND HANDLING

A. Unit shall be shipped with door handles locked shut with door handle set screws and outside air hood closed to prevent damage during transport and temporary storage.

B. Follow IOM instructions for rigging and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the IOM.

1.7 WARRANTY

A. Unit Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment which fail in materials or workmanship within specified warranty period. Warranty period shall begin at startup, or six months after shipment, whichever occurs first:

1. Parts Warranty Period for Packaged Energy Recovery Units: One (1) year.
2. Parts Warranty Period for Compressors: Five (5) years.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed.
1. Filters: One set of each type of filter specified.

PART 2 – PRODUCTS

2.1 PACKAGED ENERGY RECOVERY UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Daikin, Valent, Annex Air, Venmar
2. Or preapproved equal

B. Unit Construction:

1. Base: Manufacturer’s standard base shall be constructed of minimum 10 gage galvanized steel with 16 gage integral floor pan. Floor pan shall be insulated with minimum 1/4” closed cell neoprene liner. All floor seams shall have a raised rib joint. Penetrations through the floor shall have a minimum 3/8” raised rib around each opening. Base shall have a minimum 4” overhang over the top of a roof curb to prevent water infiltration.
2. Panels: Manufacturer’s standard casing shall be constructed of minimum 2-inch, foam-injected, double-wall panels.

a. Individual panels shall be constructed so that there is no metal-to-metal contact between the interior and exterior sheet metal of each panel.
b. Interior side of panel shall be 22 gage G-90 galvanized steel. Exterior side of panel shall be 22 gage pre-painted steel rated for 1000 hours of salt spray exposure in accordance with ASTM B117 and ASTM D1654.

c. Insulation shall be 2 lb/ft^3 injected foam insulation with a minimum R-value of 13. Foam sheet or fiberglass insulation are not acceptable due to reduced durability of panel and increased chance for rust forming between the panels. Insulation water absorption must be no more than 0.038 lb/ft per ASTM D2842 and show "no growth" per ASTM G21 biocide testing. Interior sheet metal shall encase insulation so that it is not exposed to the airstream.

3. Access doors shall be provided for access to all internal components requiring regular maintenance or inspection. Access door construction and materials shall be identical to unit casing. Access doors shall have galvanized hinges and a minimum of two quarter-turn compression latches with adjustable catches. Access doors shall be sealed with a full-perimeter D-shaped gasket constructed of EPDM sponge rubber.
4. Roof shall be pitched away from access doors and include a minimum ½" overhang around the perimeter of the unit.
5. Outdoor Air Inlet: Outdoor units shall be provided with a factory provided, field-assembled weather hood with protective bird screen on the outdoor air inlet. Indoor units shall be provided with duct connections at the outdoor air inlet.
6. Unit return shall be bottom..
7. Unit discharge shall be down flow without the need for a plenum curb.
8. Unit shall include lifting eyes on top of unit for use during rigging.
9. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
10. Motorized dampers – Outside Air and Return Air

    a. Frame shall be constructed of a 16 gage galvanized steel hat-channel.
    b. Blades shall be constructed of 16 gage galvanized steel strengthened by three longitudinal 1 inch deep "vee" grooves.
    c. Blades shall be symmetrical relative to its axle pivot point.
    d. Axle bearings shall be synthetic sleeve-type and rotate inside extruded holes in the damper frame.
    e. Blade seals shall be extruded vinyl permanently bonded to the appropriate blade edges.
    f. Frame shall include flexible stainless steel compression-type jamb seals.
    g. Modulating spring-return actuators shall be provided by the factory, installed on the damper, and wired to the control center. Each damper shall have a dedicated actuator. Single actuators with gear trains are not acceptable.
    h. Damper leakage shall be no more than 3 cfm/sq.ft. at 1 in.wg static pressure.

11. Exhaust: Gravity backdraft damper with internal bird screen.

C. Heat Recovery Device: Enthalpic Wheel Heat Exchanger

1. Energy recovery shall be an integral part of unit from the manufacturer. No field assembly, ducting, or wiring shall be required with the energy recovery option.
2. Unit shall be provided with modulating outdoor air economizer section with ARI certified energy recovery wheel. Enthalpy wheel shall be constructed of corrugated synthetic fibrous media, with desiccant intimately bound and uniformly and permanently dispersed throughout the matrix structure of the media. Face flatness of the wheel shall be maximized (+/-0.032 in) to minimize wear on inner seal surfaces and to minimize cross leakage. Modulating 100 Percent Exhaust Air Fan Option: Two, double-inlet, forward-curved fans shall be mounted on a common shaft with fixed sheave drive. All fans shall b e dynamically balanced and tested in the factory before being installed in the unit. Fan shaft shall be mounted on two grease lubricated ball bearings designed for 200,000 hour average life. On motor sizes larger than five hp the entire assembly shall be completely isolated from the unit and the fan unit by double deflection, rubber in shear isolators or spring isolation. Discharge dampers at unit outlet shall modulate the exhaust airflow in response to the OA damper position. All exhaust fan motors meet the U.S. Energy Policy Act of 1992 (EPACT) Refer to the control sequences for outside control.

D. DX Cooling Coil:

1. Coil shall be rated in accordance to AHRI standards, designed to withstand 250 psig working pressure at 300 degrees F, and pressure tested to 600 psig.
2. Coil shall be a minimum of 4 rows deep with maximum fin density of 16 fins per inch.
3. Refrigeration systems with more than one circuit shall have interlaced evaporator coils.
4. Coil casing shall be constructed of 16 gage 304 stainless steel.
5. Coil tubes shall be constructed of 1/2" diameter, 0.016" thick seamless copper tubing.
6. Coil fins shall be constructed of 0.0060" thick aluminum.
7. Coil shall be hydrogen or helium leak tested.
8. Drain pan

    a. Drain pan shall be constructed of a minimum of 18 gage 201 stainless steel.
    b. Drain pan shall be double-sloped to ensure condensate removal from unit.
    c. Drain pan shall extend a minimum of 8” past the evaporator coil to ensure condensate retention.

E. Compressors:

1. Compressors shall be hermetic scroll type and include the following items:

    a. Suction and discharge isolation valves.
    b. Reverse rotation protection.
    c. Oil level adjustment.
    d. Oil filter.
    e. Filter drier
    f. Short cycling control.
    g. High and low pressure limits.
    h. Crankcase heaters.
    i. Thermal overload.
2. Compressors shall be installed in a separate compartment which can be accessed without affecting unit operation, above the unit floor, and isolated from the surrounding environment by double wall foam injected panels and access doors.
3. Compressors shall be installed using manufacturer's recommended rubber vibration isolators.
4. Capacity control shall be provided through the use of an inverter, variable speed compressor. Due to sound and efficiency requirements, digital scroll (variable capacity) compressors shall not be acceptable. Additional compressors, if required, shall be fixed stage scroll compressors.

F. Hot Gas Reheat:

1. Hot-gas reheat coil shall be separated from the evaporator coil by a minimum of 6” in the direction of airflow to prevent the re-evaporation of condensate, provide room for coil cleaning, and allow control system to monitor evaporator coil leaving dew point temperature.
2. Coil shall be rated in accordance to AHRI standards, designed to withstand 250 psig working pressure at 300 degrees F, and pressure tested to 600 psig.
3. Coil casing shall be constructed of 16 gage galvanized steel.
4. Coil tubes shall be constructed of 5/16" diameter, 0.012" thick seamless copper tubing.
5. Coil fins shall be constructed of 0.0060" thick aluminum fins.
6. Hot-gas reheat shall be controlled through a factory-supplied and controlled modulating 3-way valve.
7. Coil shall be hydrogen or helium leak tested.

G. Air Cooled Condenser:

1. Air cooled condenser coil shall be unit mounted.
2. Provide condenser coils with galvanized casing, seamless copper tubes, and aluminum fins.
3. Coil shall be rated in accordance to AHRI standards, designed to withstand 250 psig working pressure at 300 degrees F, and pressure tested to 600 psig.

4. Coil casing shall be constructed of 16 gage galvanized steel.
5. Coil tubes shall be constructed of 5/16" diameter, 0.012" thick seamless copper tubing.
6. Coil fins shall be constructed of 0.0060" thick aluminum fins.
7. Condenser coils shall be mounted at a minimum 30 degree angle from vertical to help prevent hail damage.
8. Coil shall be hydrogen or helium leak tested.

H. Condensing Fans – Low ambient:

1. Condensing section shall be equipped with 1140 rpm direct-drive condensing fans.
2. Condensing fan assembly shall be statically and dynamically balanced in accordance with AMCA Standard 204-05.
3. Condensing fan assembly shall consist of aluminum-bladed propeller fan wheel, formed-channel base, formed inlet venturi, and coated steel basket guard on the discharge.
4. A factory-supplied variable frequency drive shall be provided to modulate a single condensing fan to maintain refrigerant pressure in the condensing section.
5. All additional condensing fans shall enable/disable to maintain refrigerant pressure in the condensing section.

I. Direct Drive Supply and Exhaust Airflow Blowers:

1. Fan assemblies shall be direct-drive without the use of belts or adjustable sheaves.
2. A variable frequency drive (VFD) shall be provided for each fan section where required. VFD shall be mounted, wired, and programmed by the equipment manufacturer. VFD shall be located in an enclosed compartment outside of the supply or exhaust air stream.
3. Fan wheels shall be constructed of a minimum of seven, stitch welded backward curved aluminum blades (APD).
4. Fan wheel shall be tested in accordance to AMCA 210. Fan speed shall not exceed 2400 RPM.
5. Fans may be full width. Fans modified to partial width through the use of banding or other blade reduction method are not acceptable.
6. Fans shall be mounted on minimum 1” tall neoprene isolators.
7. Fan motor shall be VFD rated, ODP type, EPACT compliant, and shall be of premium efficiency (PE).
8. Shaft grounding rings shall be provided on supply and exhaust fan motors.

J. Gas Heat:

1. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.
    a. CSA Approval: Designed and certified by and bearing label of CSA.
2. Burners: Stainless steel.
    a. Fuel: Natural gas.
    b. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.
3. Heat-Exchanger and Drain Pan: Stainless steel.
4. Venting: Gravity vented.
5. Gas Valve Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.
6. Gas Control Valve: Modulating. Provide 12:1 capacity modulation range.

K. Filters:

1. Outdoor air filters

   a. Outdoor air filter rack shall accommodate factory-provided 2" MERV8 filters.
   b. Filter sections shall be accessible through a 2" foam-injected, double-wall, hinged access door with quarter-turn latches.

2. Return air filters

   a. Return air filter rack shall accommodate factory-provided 2" MERV8 filters.
   b. Filter sections shall be accessible through a 2" thick, foam-injected, double-wall, hinged access door with quarter-turn latches.

L. Electrical:

1. Unit shall be constructed with an integral electrical and control center isolated from supply airflow, exhaust airflow, compressors, and heating elements. The control center shall control all aspects of the unit operation. VFDs with overload protection shall be provided for each fan bank.
2. Units shall be wired according to NEC and listed per ETL. ETL listing shall cover all components of the ventilator and not be limited to the control panel. All major electrical components shall be UL or ETL listed.
3. Unit shall have a single point of connection with integral unit mounted disconnect.
4. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 7% out of balance on voltage, the voltage is more than 7% under design voltage, or on phase reversal.
5. The following items shall be provided and wired within the control center by the factory:
   a. Non-fused disconnect.
   b. Sub-circuit fusing.
   c. Low voltage transformers.
   d. Controls as specified in this section.
   e. Control circuit fusing.
   f. Terminal block.
   g. Supply and Exhaust Fan motor Variable Frequency Drives (VFDs).
6. Electrical panel must house all high voltage components such as terminal blocks, variable frequency drives, and fuse blocks.
7. All electrical power and controls wiring shall run in chase located between unit ceiling and roof to minimize interior wall penetrations and allow for ease of access.
8. Options

   a. Unit shall include a factory supplied, mounted, and wired electric heating element in the control panel to maintain a minimum of 0F in the panel.

M. Controls:

1. Units shall include factory supplied, mounted, wired, and tested stand-alone microprocessor controls.
2. Microprocessor controller shall be factory-programmed for discharge air control and use an internal 7-day time clock.
3. Microprocessor controller shall include local liquid crystal display (LCD) for user interface. Microprocessor controller remote LCD shall be mounted in a weather-proof enclosure and accessible without exposing the operator to high voltage wiring or having to turn off or circumvent the main disconnect.
4. Microprocessor controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
5. The following sensors shall be factory supplied, mounted, and wired inside the unit:

a. Outdoor air humidity sensor.
b. Outdoor air temperature sensor.
c. Evaporator coil leaving air temperature sensor.
d. Supply air filter pressure monitoring switch.

6. The following devices shall be factory-supplied for field installation and wiring:

   a. Supply air temp temperature sensor.

7. Microprocessor controller shall include BACnet MSTP communications for building management system interface.
8. Microprocessor controller shall include a Web UI interface for remote web-based access of all unit digital and analog inputs and outputs. Web UI shall include unit scheduling, point trending capabilities, and an alarm history.

N. Dampers:

1. ASHRAE/IES 90.1 sets requirements for dampers.

2. Leakage Rate: Comply with ASHRAE/IES 90.1.

3. Damper Motor: Modulating with adjustable minimum position.

4. Outdoor Airflow Monitoring Station: Thermal dispersion type air flow monitoring station equal to an Ebtron Hybrid Series.

   a. Control: Controller shall adjust the outdoor damper position to maintain minimum outdoor air cfm.

   b. Accuracy: 5 % of minimum and maximum airflow.

5. Economizer: The economizer section shall include outdoor, return, and exhaust air dampers.

   a. Operation: Integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature.
   b. Control: Comparative enthalpy control.

O. Roof Curbs:

1. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

   a. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

   b. Materials: ASTM C 1071, Type I or II.

   c. Thickness: See detail on drawings.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

   a. Liner Adhesive: Comply with ASTM C 916, Type I.
   b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.

c. Liner materials applied in this location shall have airstream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C 916, Type I.

3. Curb Dimensions: Height of 14 inches (355 mm).

4. Acoustical Treatment: Solid bottom construction with composite acoustical liners and insulation of not less than 4 inches of material.

5. Vibration Isolation: Spring rails with 2" deflection springs.

2.2 FACTORY VERIFICATION TESTING

A. Unit shall be thoroughly run tested prior to shipment from the factory.

B. Factory run test report shall be provided at the request of the engineer, contractor, or owner.

C. Testing Procedures

1. Unit shall be subjected to and pass a dielectric (hipot) test.
2. All motorized dampers shall be cycled one full stroke while installed in the unit using the factory-provided motorized actuators.
3. Supply fan

a. Visually inspect ramp-up, ramp-down, and rotation direction of fan when enabled.
b. Verify fan pressure proving switch operation.
c. Measure and record current draw through supply fan motor(s).

4. Exhaust fan

a. Visually inspect ramp-up, ramp-down, and rotation direction of fan when enabled.
b. Verify fan pressure proving switch operation.
c. Measure and record current draw through exhaust fan motor(s).

5. Condensing fans

a. Ensure fans rotate freely without obstruction.
b. Energize fans and ensure proper rotation.
c. Measure and record the amount of current draw through each condensing fan.

6. Refrigeration system

a. Measure and record subcooling and superheat on circuit A with hot-gas reheat valve closed (0%) after 15 minutes of steady-state operation.
b. Measure and record subcooling and superheat on circuit A with hot-gas reheat valve open (100%) after 15 minutes of steady-state operation.
c. Measure and record subcooling and superheat on circuit B after 15 minutes of steady-state operation.

D. Test report shall be provided prior to unit startup and available from the factory upon request.

2.3 CAPAPACITIES AND CHARACTERISTICS

A. As indicated on the drawing schedules.

PART 3 – EXAMINATION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that do not comply, or are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Unit Support:

B. Install units with clearances for service and maintenance.

C. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

D. Comply with ANSI Z223.1 and CGA B149.1 or CGA B149.2 for field gas piping and venting.

E. Pipe condensate drains from drain pans to nearest floor drain.

3.3 CONNECTIONS

A. Comply with requirements for ductwork specified in Section 233113 "Metal Ducts."

B. Install electrical devices furnished with units but not factory mounted.

3.4 FIELD QUALITY CONTROL

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

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including all connections.

C. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized and crankcase heaters have had sufficient on-time, start units to confirm proper motor rotation and unit operation.
2. Enter or adjust all controller set-points as required to meet specific project requirements.
3. Set initial temperature and humidity set points.
4. Set field-adjustable switches as indicated.

D. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 SEQUENCE OF OPERATION

A. As indicated elsewhere in the project documents.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 237413

DIVISION 23 - MECHANICAL

SECTION 237416 - PACKAGED, ROOFTOP AIR-CONDITIONING UNITS 28 TONS AND UNDER

PART 1 - GENERAL

1.1 The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section and which are hereby made a part of the work specified in this section.

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

A. Section includes packaged, small-capacity, rooftop air-conditioning units (RTUs) with the following components and accessories:

1. Casings.
2. Fans.
3. Motors.
4. Refrigerant circuit components.
5. Air filtration.
6. Gas furnaces.
7. Dampers.
8. Electrical power connections.
9. Controls.
10. Accessories.
11. Roof curbs.

1.4 DEFINITIONS

A. DDC: Direct digital controls.

B. ECM: Electronically commutated motor.

C. MERV: Minimum efficiency reporting value.

D. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

E. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, small-capacity, rooftop air-conditioning units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

F. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

G. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

1.5 ACTION SUBMITTALS

A. Product Data: For each RTU.

1. Include manufacturer's technical data.
2. Include rated capacities, dimensions, required clearances, characteristics, and furnished specialties and accessories.
3.

B. Shop Drawings:

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For RTU supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which RTUs will be attached.
2. Roof openings.
3. Roof curbs and flashing.

B. Field quality-control reports.

C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: One set for each belt-driven fan.
2. Filters: One set of filters for each unit.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion. Compressor warranty to include labor.
2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. AHRI Compliance:

1. Comply with AHRI 210/240 for testing and rating energy efficiencies for RTUs.
2. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
3. Comply with AHRI 270 for testing and rating sound performance for RTUs.
4. Comply with AHRI 1060 for testing and rating performance for air-to-air exchanger.

B. AMCA Compliance:

1. Comply with AMCA 11 and bear the AMCA-Certified Ratings Seal for air and sound performance according to AMCA 211 and AMCA 311.
2. Damper leakage tested according to AMCA 500-D.
3. Operating Limits: Classify according to AMCA 99.

C. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IES Compliance: Comply with applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. NFPA Compliance: Comply with NFPA 90A or NFPA 90B.

F. UL Compliance: Comply with UL 1995.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 MANUFACTURERS

A. Available Manufacturers include:

1. Aaon
2. Carrier Corporation
3. Daikin – Basis of Design

2.3 CAPACITIES AND CHARACTERISTICS – See schedules. Substitution from Basis of Design to be as scheduled or lower. Sound data has been coordinated with the acoustical consultant and basis of design.

2.4 CASINGS

A. Exterior Casing Material: 24 gauge galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

B. Inner Casing Fabrication Requirements:
1. Inside Casing: 24 gauge galvanized steel.

C. Cabinet Thermal Performance:
1. Minimum Overall R-Value: R-13.
2. Include effects of metal-to-metal contact and thermal bridges in the calculations.

D. Cabinet Surface Condensation:
1. Cabinet shall have additional insulation and vapor seals if required to prevent condensation on the interior and exterior of the cabinet.

E. Corrosion-Resistant Coating: Apply a corrosion-resistant coating capable of withstanding a 1000-hour salt-spray test according to ASTM B 117.

1. Standards:

a. ASTM B-117 for salt spray.

2. UV Protection: Spray-applied topcoat.

F. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

1. Materials: ASTM C 1071, Type I.
2. Thickness: 2 inch (25 mm).
3. Liner Adhesive: Comply with ASTM C 916, Type I.

G. Floor: Double wall, reinforced, metal surface; reinforced to limit deflection when walked on by service personnel. Insulation shall be below metal walking surface.

H. Condensate Drain Pans: Fabricated using rigid heavy gauge stainless steel, a minimum of 2 inches (50 mm) deep, and complying with ASHRAE 62.1 for design and construction of drain pans. Provide condensate overflow switch.

I. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.5 FANS

A. Plenum Fan Type: Single width, non-overloading, with backward-inclined or airfoil blades.

1. Fan Wheel Material: Aluminum; attached directly to motor shaft.
2. Fan Wheel Drive and Arrangement: Direct drive, AMCA Arrangement 4.
3. Fan panel and frame Material: Powder-coated steel, stainless steel, or aluminum.
4. Fan Enclosure: Easily removable enclosure around rotating parts.
5. Fan Balance: Precision balance fan below 0.08 inch/s at design speed with filter in.
6. Modulation Range: 15% to 100% capacity.

B. Condenser-Coil Fan: Three blade, low sound fan, polycomposite material, propeller type. Due to project sound requirements, fans provided with serrated blades for low sound performance.

a. Fan motors shall be an ECM, Electronically Commutated Motor for proportional control.
   1) The unit controller shall proportionally control the speed of the condenser fan motors to maintain proper head pressure of the refrigerant circuit from ambient condition of 0~125°F.
   2) Mechanical cooling shall be provided to 25º F.
   3) The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase.

2.6 MOTORS

A. Comply with Section 230513 "Common Motor Requirements for HVAC Equipment" and the requirements of this Article.

B. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

C. Enclosure: ECM type

D. Service Factor: 1.15.

E. Motor Bearings: Sealed, permanent.

F. Efficiency: Premium

2.7 COILS

A. Supply-Air Refrigerant Coil:

1. Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coils from contacting steel coil frame or condensate pan.
3. Coil Split: Interlaced.

B. Hot-Gas Reheat Refrigerant Coil:

1. Aluminum microchannel type.
2. Polymer strip shall prevent all copper coils from contacting steel coil frame or condensate pan.
3. Temperature Rise: 20°F at all operating conditions
4. Suction-discharge bypass valve.
5. Capacity Control: Fully modulating
6. Control Deadband: +/- 2 F.

C. Outdoor-Air Refrigerant Coil:

1. Capacity Ratings: Complying with ASHRAE 33 and ARI 410.
2. Tube Material: Microchannel aluminum.
3. Fin Material: Aluminum.
4. Fin and Tube Joint: Mechanical bond.
5. Leak Test: Coils shall be leak tested with air underwater.

2.8 REFRIGERANT CIRCUIT COMPONENTS

A. Compressor: Hermetic, variable speed, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief.
1. Due to sound and efficiency requirements, digital scroll compressor shall not be acceptable.

B. Refrigeration Specialties:

1. Refrigerant: R-410A.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.
9. Low-ambient kit high-pressure sensor.
10. Hot-gas reheat solenoid valve modulating with a replaceable magnetic coil.
11. Four-way reversing valve with a replaceable magnetic coil, thermostatic expansion valves with bypass check valves, and a suction line accumulator.

2.9 AIR FILTRATION

A. Minimum arrestance and MERV according to ASHRAE 52.2.

B. Extended-Surface, Disposable Panel Filters:

1. Comply with NFPA 90A.
2. Factory-fabricated, dry, extended-surface type.
3. Thickness: 2 inches.
4. Minimum Arrestance: 90, according to ASHRAE 52.1.

5. Minimum MERV: 8, according to ASHRAE 52.2.
6. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.

2.10 INDIRECT FIRED GAS FURNACE

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.

1. CSA Approval: Designed and certified by and bearing label of CSA.

B. Burners: Stainless steel.

1. Fuel: Natural gas.
2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.

C. Heat-Exchanger and Drain Pan: Stainless steel.

D. Venting: Gravity vented.

E. Gas Valve Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

F. Gas Control Valve: Modulating. Provide 10:1 minimum capacity modulation.

2.11 DAMPERS

A. Leakage Rate: Comply with ASHRAE/IES 90.1.

B. Damper Motor: Modulating with adjustable minimum position.

C. Outdoor Airflow Monitoring Station: Thermal dispersion type air flow monitoring station equal to an Ebtron Hybrid Series.

1. Control: Controller shall adjust the outdoor damper position to maintain minimum outdoor air cfm.
2. Accuracy: 5 % of minimum and maximum airflow.

D. Economizer: The economizer section shall include outdoor, return, and exhaust air dampers.
1. Operation: Integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature.
2. Control: Comparative enthalpy control.

2.12 ELECTRICAL POWER CONNECTIONS

A. RTU shall have a single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.13 CONTROLS

A. Control equipment and sequence of operation are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

B. Basic Unit Controls (Provided by Unit Manufacturer):

1. Control-voltage transformer.
2. Wall-mounted thermostat or sensor with the following features:

a. Heat-cool-off switch.
b. Fan on-auto switch.
c. Fan-speed switch.
d. Automatic changeover.
e. Adjustable deadband.
f. Exposed set point.
g. Exposed indication.
h. Degree F indication.
i. Unoccupied-period-override push button.
j. Data entry and access port to input temperature and humidity set points, occupied and unoccupied periods, and output room temperature and humidity, supply-air temperature, operating mode, and status.

3. Wall-mounted humidistat or sensor with the following features:

a. Exposed set point.
b. Exposed indication.

4. Unit-Mounted Annunciator Panel for Each Unit:

a. DDC controller or programmable timer and interface with HVAC instrumentation and control system.
b. Digital display of outdoor-air temperature, supply-air temperature, return-air temperature, economizer damper position, indoor-air quality, and control parameters.

C. DDC Controller:

1. Controller shall have volatile-memory backup.

2. Programable time clock with built-in scheduling.
3. Safety Control Operation:

a. Low-Discharge Temperature: Stop fan and close outdoor-air damper if supply-air temperature is less than 40 deg F (4 deg C).
b. Defrost Control for Condenser Coil: Pressure differential switch to initiate defrost sequence.

4. Scheduled Operation: See sequence of operations.

D. Interface Requirements for HVAC Instrumentation and Control System:

1. Interface relay for scheduled operation.
2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.
3. Provide BACnet compatible interface for central HVAC control workstation for the following:

a. Adjusting set points.
b. Monitoring supply fan start, stop, and operation.
c. Inquiring data to include outdoor-air damper position, supply- and room-air temperature and humidity.
d. Monitoring occupied and unoccupied operations.
e. Monitoring constant and variable motor loads.
f. Monitoring variable-frequency drive operation.
g. Monitoring cooling load.
h. Monitoring economizer cycles.
i. Monitoring air-distribution static pressure and ventilation air volume.

2.14 ACCESSORIES

A. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

B. Remote potentiometer to adjust minimum economizer damper position.

C. Safeties:

1. Condensate overflow switch.
2. Phase-loss reversal protection.
3. High and low pressure control.
4. Gas furnace airflow-proving switch.

D. Hail protection.

E. Outdoor-air intake weather hood.

2.15 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

a. Materials: ASTM C 1071, Type I or II.
b. Thickness: See detail on drawings.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

a. Liner Adhesive: Comply with ASTM C 916, Type I.
b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
c. Liner materials applied in this location shall have airstream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C 916, Type I.

B. Curb Dimensions: Height of 14 inches (355 mm).

C. Acoustical Treatment: Solid bottom construction with composite acoustical liners and insulation of not less than 4 inches of material.

D. Vibration Isolation: Spring rails with 2” deflection springs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Curb: Install on roof structure, level and secure, according to NRCA's "NRCA Roofing Manual: Membrane Roof Systems.". Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

3.3 CONNECTIONS

A. Comply with duct installation requirements specified in other HVAC Sections. Drawings indicate general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

B. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

C. Where installing piping adjacent to RTUs, allow space for service and maintenance.

1. Gas Piping: Comply with applicable requirements in Section 231123 "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

D. Connect electrical wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs as layers of black with engraved white letters at least 1/2-inch (13-mm) high.
3. Locate nameplate where easily visible.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. RTU will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Inspect for visible damage to unit casing.
3. Inspect for visible damage to furnace combustion chamber.
4. Inspect for visible damage to compressor, coils, and fans.
5. Inspect internal insulation.
6. Verify that labels are clearly visible.
7. Verify that clearances have been provided for servicing.
8. Verify that controls are connected and operable.
9. Verify that filters are installed.
10. Clean condenser coil and inspect for construction debris.
11. Clean furnace flue and inspect for construction debris.
12. Connect and purge gas line.
13. Remove packing from vibration isolators.
14. Inspect operation of barometric relief dampers.
15. Verify lubrication on fan and motor bearings.
16. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
17. Adjust fan belts to proper alignment and tension.

18. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

19. Inspect and record performance of interlocks and protective devices; verify sequences.
20. Operate unit for an initial period as recommended or required by manufacturer.
21. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency:

    a. Measure gas pressure on manifold.
    b. Inspect operation of power vents.
    c. Measure combustion-air temperature at inlet to combustion chamber.
    d. Measure flue-gas temperature at furnace discharge.
    e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

22. Calibrate thermostats.
23. Adjust and inspect high-temperature limits.
24. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
25. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F (8 deg C) above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

26. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.

27. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outdoor-air intake volume.

28. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

29. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-temperature limit on gas-fired heat exchanger.
    b. Low-temperature safety operation.
    c. Filter high-pressure differential alarm.
    d. Economizer to minimum outdoor-air changeover.

e. Relief-air fan operation.

30. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION 237416

Part 1. GENERAL

1.01 RELATED DOCUMENTS

A Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications section, apply to work of this section.

B Division 26 Basic Materials and Methods sections apply to work of this section.

1.02 INTENT

A The intent of this specification is to provide for furnishing all necessary equipment, as detailed on drawings and/or schedules, for a complete lighting and control system. For the sake of brevity, these specifications shall omit phrases such as "Contractor shall furnish and install", "unless otherwise indicated or specified", etc., but these phrases are nevertheless implied. Mention of materials and operations requires the Contractor to furnish and install such materials and perform such operations completely to the satisfaction of the owner' s representative.

B Lighting Control Narrative

1. House entry stations are to turn all houselights on and all house/worklights off.
2. Stage entry stations are to turn on overstage works and all house/worklights off.
3. Touchscreens to be identical with full tracking of preset playback. They shall have a page to control houselights and corresponding presets. There shall be a separate page for stage presets.
4. Preset record is to only be enabled from the touchscreen with a password.
5. Touchscreens shall have a button to lockout the entry stations from unauthorized use.
6. The lighting control system shall be built on a sACN infrastructure to allow for flexibility.
7. There shall be hardwired DMX for lighting control to all appropriate locations. The wireless DMX distribution is prohibited.
8. The system shall support portable control from end users mobile devices.

1.03 QUALITY ASSURANCE

A Manufacturer shall be one who has been continuously engaged in the manufacturer of lighting control equipment for a minimum of ten years. All dimmer and cabinet fabrication must take place in a U.S.manufacturing plant.

B The manufacturer shall have a toll free 24-hour hotline with a maximum response time of 20 minutes, 24 hours a day and 365 days a year.

C All equipment, where applicable standards have been established, shall be built to the standards of Underwriters Laboratories, Inc., the National Electric Code and the United States Institute for Theater Technology. Permanently installed power distribution equipment such as dimmer racks and distribution shall be UL and C-UL Listed, and/or CE marked (where applicable) and bear the appropriate labels. Portable equipment such as consoles and fixtures shall be UL and C-UL Listed, ETL Listed and/or CE marked (where applicable) and bear the appropriate labelsEquipment specified herein shall be the sole responsibility of a single theatrical systems integrator.

1.04 APPROVALS

A The following manufactures are the basis of design and shall be considered approved:

1. Electronic Theatre Controls (ETC)
2. Altman Lighting
3. SSRC
4. The Light Source

B Prior approval is required for alternate proposals.

C Specific items of equipment are specified by trade names. It has been determined by the systems designer that these are the particular items desired by the Owner and establish a standard of quality, equipment function and/or process. It is not the purpose or intent of these documents to eliminate competitive bids. In order to allow proper and fair comparison of pricing, contractors are required to submit their base bid price on the specified equipment. A contractor may submit an alternate bid based on equipment different from that specified only if that Contractor has received prior approval in writing from the Architect at least 10 days prior to bid. Accompanying each request shall be a letter specifically detailing each substitution including catalog data, specifications, operative samples, technical information, drawings, performance and test data, and complete descriptive and functional information to assist in a fair evaluation. Failure to submit any substitution for prior approval or not providing sufficient data for evaluation shall require the exact item specified to be furnished. Architect's approval of a substitution for bid purposes will not relieve the contractor from the responsibility of meeting all specification criteria. If an approval of a substitution is granted, the Contractor shall be fully responsible for any and all changes (wiring, power, distribution, support structure, etc.) such substitution shall require.

1.05 SCOPE

A The work included under this specification shall cover all labor, materials, and equipment to furnish the lighting control system herein specified.

1. The electrical contractor is responsible for installing the equipment provided by the theatrical systems integrator.
2. The theatrical systems integrator is responsible for installing the portable theatrical lighting fixtures.
3. The theatrical systems integrator is responsible for low voltage control wiring terminations at equipment supplied in this specification. All other terminations are by the electrical contractor.
4. The electrical contractor shall furnish all conduit, wire, connectors, hardware and other incidental items necessary for the complete and proper operation of the lighting control system.
5. The electrical contractor shall remove and store for installation in new construction (12) ETC S4 Jr Ellipsoidals with attached clamp and safety cable along with (21) Elation SixPar 100 LED fixtures with attached clamp and safety as well as interconnecting cables.

B It shall also include the services of a qualified engineer regularly employed by the manufacturer of the system that shall check the installation and ensure its proper operation.

C It shall also include the services of a qualified systems integrator that shall be an ETCP recognized employer. Field service technicians must be current on factory certifications.

D No part of the system shall be energized before being so checked and the installation approved. Failure to observe this provision shall automatically relieve the manufacturer of any responsibility concerning the proper operation of the system or any part thereof and the replacement of parts that may have been damaged by the premature energizing.

1.06 SUBMITTALS

A The manufacturer shall provide one (1) complete set of electronic submittal drawings for approval, prior to manufacture of any of the components. Submittals shall include:

1. Full system riser diagram(s) illustrating interconnection of system components, wiring requirements, back box sizes and any special installation considerations.
2. Full set of printed technical data sheets.

3. Detailed set of dimmer schedules
4. Detailed set of circuit and control schedules, including a complete list of all deviations from specifications.

B On the dimming system, bidders submitting other equipment shall include all pertinent information showing in what respect the system will function in accordance with the specifications. In the case of substitution of the control system, the bidder shall submit the name of the manufacturer and a list of three or more operating systems (with names and telephone numbers of contacts).

C All fixtures supplied shall meet or exceed the mechanical, electrical, optical, and performance data published for the equipment listed herein.

D If required by the Architect or Engineer, the bidder shall provide at his expense, samples of proposed units for testing by an independent testing laboratory. All costs for these tests shall be the responsibility of the bidder.

E It shall be understood that any additions or revisions of wiring required by the use of substitute equipment shall be the responsibility of the bidder making the substitution.

F Field commissioning and instructional checkout shall be provided within 21 days of written request by the electrical contractor.

G If the installation is not sufficiently complete to perform the checkout upon arrival of the factory certified field service technician, all costs for the additional trips shall be paid by the contractor.

1.07 SHOP DRAWING REVIEW AND APPROVAL

A Shop drawings shall be furnished for approval prior to fabrication of the equipment. A set of drawings shall be returned, appropriately marked, as the approval document.

B When the installation is complete, the owner shall be supplied with "as built" drawings which shall be incorporated as part of the Operation and Maintenance Manual. Maintenance information shall be provided on all major units and principal components of the system.

1.08 WARRANTY

A The manufacturer shall warrant his equipment to be free from defects in material and workmanship for a period of twenty-four (24) months after the manufacturer's checkout of the installation. All theatrical lighting fixtures shall carry a warranty of no less than sixty (60) months after substantial completion.

B Nothing in this guarantee shall cause repair or replacement by the Contractor where negligence, neglect or improper operation by the Owner has caused the failure of any equipment installed under this contract.

1.09 STANDARDS

A All lighting instruments and control system components, where applicable standards have been established shall follow the recommendations of a National Registered Testing Laboratories and the National Electrical Code, and must bear appropriate labels.

B Manufacturers

1. Provide products by the manufacturers indicated on the drawings and specifications. This apparatus is fully catalogued and described with complete technical data available from the manufacturers.
2. The theatrical lighting and control equipment basis of design is as specified in these documents.
3. The listing of a manufacturer as "equivalent systems" does not imply automatic approval. It is the responsibility of the Electrical Contractor to ensure that any price quotation and products meets or exceed the specifications herein.

1.10 SYSTEM INTEGRATOR

A A System Integrator shall be utilized. The integrator shall also be responsible for all commissioning services in section 265561. The following companies have prior approval as System Integrator:

Vincent Lighting Systems
1420 Jamike Ave #1
Erlanger, KY 41018
Tel: 859-488-4915
www.vls.com

Indianapolis Stage
905 Massachusetts Ave
Indianapolis, IN 46202
Tel: 317-635-9439
www.indystage.com

Associated Controls + Design
6850 Guion Rd
Indianapolis, IN 46268
Tel: 317-298-3961
www.acdtheatrical.com

B In order to be considered as a System Integrator on this project, each Contractor requesting approval must submit to the Architect at least ten (10) days prior to the date of bid opening a letter expressing his intent to bid. This letter shall include a list of at least five (5) projects of similar size and scope completed by this firm within the last five (5) years. Inspection of one completed installation may be requested by the Architect/Engineer's Representative prior to consideration of request to bid. The System Integrator shall have been in business under the same name for five (5) full years preceding the date of this bid doing work similar to the type specified. The decision of the Architect as to the capability of the Bidder to successfully complete and maintain the system based on this pre-qualification information shall be final.

C Pre-Bid request letter shall include a statement that all major items of equipment shall be bid and supplied as specified, or shall contain details of all proposed substitute equipment for review by the Architect/Engineer's Representative. Substitute equipment items to include specifications, parts numbers, and details of interconnection to proposed system. The decision of the Architect as to the acceptability of substitute equipment shall be final.

Part 2. PRODUCTS

2.01 Digital Mini Panels

A Digital Panels for lighting and pluggable loads shall be the Foundry Mini Panel by ETC, Inc., or equal.

B Mechanical

1. Mini Panels shall be constructed of 16AWG steel and finished in a black fine-texture powder paint.
2. The Mini Panel shall be no larger than 9" x 12" x 3.5" for 4 output models or 14" x 12" x 3.5" for 8 output models
3. Mini Panels shall support wall and ceiling mounting, including installation in Plenum air return spaces.
4. A removable dead front cover shall be mechanically fastened using four screws.

5. An internal safety cover made of 16AWG steel shall prevent access to all line voltage (class1) wiring and components without limiting access to low voltage terminations, changing settings during commissioning, or manual control of relays.
6. Mini Panels shall support onboard configuration without the use of software using a simple two-button interface to set start address
7. The Mini Panel shall support a contact input for use in UL 924 Emergency Systems
    a. A dry contact input shall provide triggering of an emergency condition
    b. A three position switch shall set the input as Normally Open (NO) Normally Closed (NC), or Off
    c. Load shedding shall be supported via a two position switch per zone, that includes or excludes each zone from the UL924 input
    d. The Mini Panel shall support a Demand Response input to automatically reduce overall power consumption
    e. A dry contact input shall be supported to trigger the demand response condition
    f. A single rotary dial shall be available for each to set the maximum trim level when the input is active
8. All configuration buttons shall be fully accessible when the Panel is mounted and the front panel is removed.
9. Mini Panels shall provide the following LED indicators:
    a. UL924 Active (red)
    b. Demand Response Active (green)
    c. Power OK (blue)
    d. DMX Signal/Error (green)

C Electrical

1. Power Input shall support 120-277 Volts AC 47-63Hz for control electronics and for each independent zone. Daisy Chain of an input to multiple control zones shall be supported
2. Mini Panels shall provide an optional 20A single-phase normal sense feed input for UL 924 Emergency Lighting Control Bypass
    a. The sense feed input is enabled or disabled via a two position switch
    b. Digital panels that do not provide an internal normal sense input shall not be acceptable
3. A voltage barrier shall be available to separate normal and emergency circuits or lighting and plug loads when combined in a single Panel. The barrier shall be constructed of UL94-V-0 plastic
4. Mini Panels shall provide a 20A, fully rated, normally open relay for each output rated for lighting and plug load use
5. A 0-10V dimming output per zone shall support 0-10V sink control rated for 100mA per output
    a. 0-10V wiring shall be fully isolated from ground within the Mini Panel. Panels without fully isolated 0-10V wiring shall not be acceptable
6. Mini Panels shall support Class 2, ANSI E1.11-2008, USITT DMX512A control communications
    a. Mini Panels shall provide a DMX512A wiring connection using terminal blocks for #24 AWG wire
    b. Terminal blocks for Cat5e or better wire shall also be available

c. The control network shall utilize unshielded twisted pair, Belden 9729 or equivalent wire, plus one #14 ESD drain wire (when not installed in grounded metal conduit). Use of Category 5e, or better, control network wiring shall also be supported when utilizing appropriate termination kits available from the manufacturer

7. Mini Panels shall be designed and tested to withstand discharges up to 15,000 volts (IEC 801-2) without impairment of performance.
8. Mini Panels shall provide a three position terminal for power input to the control electronics. The control power input shall accept 6-14AWG wire and be clearly marked Line, Neutral and Earth Ground
9. Each relay shall provide three screw terminals for line voltage power connection. Each terminal shall accept 6-14awg wire and be clearly labeled Input, Output and Thru. Panels that do not support a single power input to multiple discrete relays, in any combination, shall not be accepted.
10. Mini Panels shall support 0-10V dimming control via two 16-26AWG terminals for 0-10V+ and 0-10V common wiring connections
11. Mini Panels shall be UL and cUL LISTED and conform to UL 508 and UL 2043 (Plenum rated) standards

D Functional

1. Mini Panels shall be available in 4 or 8 zone configurations with a 20A, fully–rated, relay output and 0-10V dimming output per zone
2. Mini Panels shall be UL924 LISTED for emergency lighting circuits and shall activate only the selected outputs. Excluded loads shall be shed and not output during emergency conditions
3. Mini Panels shall support Demand Response input via contact closure. Upon input the Panel shall reduce maximum output to 70% of peak usage. 0-10V outputs shall support Demand response maximum level threshold adjustment using a rotary fader, and shall be assignable per circuit while measuring usage
4. Upon loss of power, Mini Panels shall return to their last state when power returns
5. Mini Panels shall support commissioning without the use of software or specialty configuration tools. Panels that require software for configuration shall not be acceptable
6. All Mini Panels shall be configurable via ANSI E1.20 Remote Device Management (RDM). RDM parameters shall include:
   a. Device Label – configure a name for the device
   b. DMX Start Address –set the starting DMX address of the Zone Controller to a value from 1-512
   c. DMX Fail Mode (Data Loss) – configure the Zone Controller behavior when DMX is lost: Hold last look, Wait and fade, Go to full (default)
   d. Packet Delay – configure the number of packets required before the zone controller activates a change of level (relay on/off or 0-10V output)
1. Mini Panels that are not configurable over RDM shall not be acceptable.

E Approved Products

1. Supply the Following:

Qty	Model	Description
1	UFMP8	8 Zone DMX Mini Panel

2.02 Wall Mount Relay Panel and load center

A General

1. The wall mount relay panel shall be the Echo Relay Panel as manufactured by ETC, Inc., or equal
2. Relay Panels shall be UL508, UL67, and UL924 Listed, and shall be so labeled when delivered
3. Relay Panels shall consist of a main enclosure with 30 pole breaker subpanel, relay/dimmer sub panel, integral control electronics, and a low voltage subpanel for data terminations and provision for accessory cards
    a. Up to two accessory cards shall be supported per relay panel

B Mechanical

1. The panel shall be constructed of 16-gauge steel. All panel components shall be properly treated and finished in fine-textured, scratch resistant paint
2. Relay panels shall be available in 120 and 277 Volt AC configurations
    a. 120V enclosures shall be 67.5" high by 14.36" wide and 4" deep with a weight not more than 80 pounds
    b. 277V enclosures shall be 67.5" high by 20" wide and 6" deep with a weight not more than 130 pounds
3. The panel shall be capable of being mounted on the surface of a wall or recessed mounted
    a. 120VAC panels shall support mounting between standard wall stud framing (16-inch on center spacing)
4. Choice of panel covers shall be available for surface or recess mount applications. This outer panel shall ship complete with a locking door to limit access to electronics and breakers, breakers
    a. Optional center-pin reject security screws shall be available for all accessible screws
    b. Recess mount doors shall extend 1" beyond all panel edges to hide wall cut-out
5. The unit shall provide interior cover over breaker panel to allow access only to class 2 wiring and prevent direct access to class 1 line voltage components
6. The Relay panel shall support up to twenty-four 20-amp single pole circuits made up of relays or 300W dimmers
    a. Two and three-pole relay circuits shall be supported at decreased density where each pole constitutes one of the available single-pole circuits. Mixing of circuits in any combination shall be supported
    b. Panels that do not support an integral dimmer module shall not be acceptable
7. Relays shall include integral switches for manual control while power is unavailable to the panel such that critical lighting can be set to an on state, without the need for power to the panel
8. Relay output lugs shall accept 6-14AWG copper wire
9. Breaker subpanel may include up to twenty-nine 20-amp single pole, up to fourteen 20 amp double pole, or nine three pole breakers as required in any combination up to capacity
10. Control wiring for DMX, station bus, and Emergency input terminations shall land on removable headers for contractor installation.

C User Interface

1. The user interface shall contain a graphical display with button pad to include 0-9 number entry, up, down back arrow navigation and enter
2. Test shortcut button shall be available for local activation of preset, sequence and set level overrides

3. The user interface shall have a power status LED indicator (Blue), a DMX status LED indicator (Green), a network status LED indicator (Green) and an LED indicator (red) for errors
4. Interface shall allow the backlight to timeout and shall provide user editable options to shut off backlight completely as well as adjust screen contrast
5. Ethernet interface shall default to automatic IP through link local and DHCP. Upon receiving IP address, the address of the Network Interface Card (NIC) shall display in the about menu. Static address and settings shall also be possible
6. The control interface shall support a USB memory stick interface for uploads of configurations and software updates

D Functional

1. Panel setup shall be user programmable. The control interface shall provide the following relay setup features (per circuit):
    a. Type (1 pole, 2 pole, or 3 pole)
    b. Name
    c. Circuit Number
    d. DMX address
    e. sACN address
    f. Space Number
    g. Circuit Mode
        1) Normal (priority and HTP based activation and dimming
        2) Latch-lock
        3) Fluorescent
        4) DALI
    h. On threshold level
    i. Off threshold level
    j. Include in UL924 emergency activation
    k. Allow Manual
2. Relay panels shall support discrete addressing of each relay. Panels that are restricted to use of start address with sequential addressing and cannot assign each 0-10V output control to any internal relay shall not be acceptable
3. The panel shall be capable of switching all relays on or off at once, or in a user-selectable delay per relay using a period of 0.1 to 60 seconds, in 0.1 second increments
4. An Ethernet connection shall provide advanced control of relays over streaming ACN (sACN) and transmit status, control override, and measured energy usage per branch circuit via an internal Web UI or central monitoring interface
    a. Control electronics shall report the following information per branch circuit
        1) Breaker state (On/Off)
        2) Breaker state (Open/Closed)
        3) Current draw (In Amps)
        4) Voltage
        5) Energy usage
    b. Panels that do not report this information shall not be acceptable
5. Built-in Control shall include:
    a. Ability to record up to 16 presets in each space from the control panel, connected control stations, or timed events
    b. Presets shall be programmable by recording current levels (as set by DMX or connected control stations), by entering levels on the control panel

directly, manually selecting relay state on each relay or a combination of these methods. From the control panel, stations, or timed events it shall be possible to record values for up to 16 zones per space

c. Up to 8 spaces in a single rack for total of up to 16 spaces shall be supported per system or system subne

d. Indication of an active preset shall be visible on the control panel display

e. One 16-step sequence per space for power up and power down routines

f. The panel shall have a UL924-listed contact input for use in Emergency Lighting systems. The panel shall respond to the contact input by setting included relays to "on", while setting non-emergency relays "off". Each relay can be selected for activation upon contact input

g. Upon Data loss the system shall provide options to hold last look infinitely or hold for a configured time period set by the installing technician then fade/switch to the input of the next available priority

h. Control electronics shall respond directly to control stations for zone, preset, and sequence control. Systems that require secondary control systems for this functionality are not acceptable

i. After power loss, electronics shall be capable of holding the system in its previous state until new level data (DMX, architectural presets, sequences and zones, or local overrides) is received to make each relay change state

   1) The control of lighting and associated systems via real time and Astronomical clock controls

j. The relay panel shall allow the activation of presets, sequence, and zone programming of up to 50 time clock events via a built in real and astronomical timeclock

k. System time events shall be programmable via the control panel.

   1) Time clock events shall be assigned to system day types. Standard day types include: everyday, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday

   2) Time clock events shall be activated based on sunrise, sunset, time of day or periodic event

   3) System shall automatically compensate for regions using a fully configurable daylight saving time

   4) Presets shall be assigned to events at the time clock

l. The time clock shall support event override

   1) It shall be possible to override the timed event schedule form the face panel of the time clock

m. The time clock shall support timed event hold

   1) It shall be possible to hold a timed event from the face panel of the processor

   2) Timed event hold shall meet California Title 24 requirements

   3) The panel shall receive ESTA DMX512-A control protocol. Addressing shall be set via the user interface button keypad with any relay being patched to any DMX control address

6. 2,500V of optical isolation shall be provided between the DMX512 inputs and the control electronics as well as between control and power components

7. The relays shall respond to control changes (DMX or Stations) in less than 25 milliseconds. DMX512 update speed shall be 40Hz

8. Setting changes shall be able to be made across all, some, or just one selected relay in a single action from the face panel

9. DMX data loss shall allow for levels/relays to be held for ever or for a specified time before switching to a lower priority source
10. Initial Panel setup
    a. The relay panel shall automatically detect the type of relay or dimmer installed in each location without need for manual configuration of the physical arrangement.
    b. Quick rack setup shall be available to apply address settings across all circuits for rack number, DMX Start Address, sACN universe, and sACN start address.
    c. Emergency Setup Menu shall provide optional delays when emergency is activated or deactivated, and option to turn off non-emergency circuits shall be available. Record function shall allow circuits that are turned on to be added to the emergency setting

E Electrical

1. Relay Panels shall be available to support power input from:
    a. 120/208V three phase 4-wire plus ground
    b. 120/240V single phase 3-wire plus ground
    c. 277/480V, 230/400V and 240/415V three phase. 4-wire plus ground
2. Conduit Entry:
    a. Feeders:
        1) Top or top-side (upper 6" of either side)
        2) Bottom or bottom-side 6" of either side
        3) Feeders shall enter through the top or bottom according to the orientation of the enclosure
        4) Feeder entry shall be nearest to the location of the feeder lugs or main breaker
    b. Load:
        1) Load wiring shall enter through the top or bottom of the enclosure
        2) Load wiring shall enter through the top/bottom surface nearest to the breaker sub panel
        3) Load wiring may also enter through left and/or right side provided a low voltage chase is not required through the same area. If class 2 chase is required, a field installable barrier panel shall be provided upon request. When installed, the left or right side of the panel, where the barrier has been installed, shall not permit load wiring
    c. Low Voltage:
        1) Top or top-side (upper 6" of either side)
        2) Bottom or bottom-side (bottom 6" of either side)
        3) For low voltage conduit entry at the relay end of the cabinet, conduits shall be located at the outer 3" of the top/bottom panel
        4) Field installed low voltage channel shall be provided separately for installation on the left or right side of the panel to allow class 2 wiring to traverse the panel from top to bottom or bottom to top
3. All relays shall be mechanically latching
4. The relay shall be capable of switching 20A at up to 300V
5. The relay panel shall support a maximum feed size of 200 Amps
6. Relay panels shall support main circuit breaker options:
    a. Main breaker options shall be optional and available for purchase upon request
    b. Main breakers shall be field installable

c. Main breakers shall be available in 100 and 200 Amps for 120V systems and 150 Amps for 277V systems
d. Series rated SCCR ratings apply as follows with appropriate main breaker:
1) 22,000A at 120/240V
2) 10,000A at 100A; 120/208V
3) 10,000A, 22,000 or 42,000 at 200A; 120/208V
4) 14,000A at 150A and 200A; 277V/480V
5) 65,000A at 200A; 277V/480V
e. Main breakers shall allow the following range of wire sizes:
1) 1AWG-300kcmil at 120/240V
2) 3/0 to 300kcmil at 120/208V
3) 6AWG-300kcmil at 277V/480V

F Relay
1. Each relay shall have a manual override switch with on/off status indication
2. Relays shall be rated for use with:
a. 16A Electronic Ballast loads @ 120, 240 and 277V
b. 20A Tungsten loads at 120, 240, and 277V
c. 20A 277V Ballast (HID)
d. Motor loads with ratings of 20 FLA @ 120V, 17 FLA @ 240V, and 14 FLA @ 277V 100,000A symmetrical SCCR
3. Isolation shall be 4000V RMS
4. Relays shall be latching state
5. Rated Life:
a. 1,000,000 mechanical activations
b. 100,000 cycles at full resistive load
c. 30,000 cycles full motor, inductive, tungsten, and electronic (LED)
d. Decreasing loading shall increase the rated life of the relay inversely proportional the square of the load
6. Relays shall support reporting of current usage with an accuracy of five percent of the connected load

G Dimmer Modules
1. Dimmer modules shall be available as either forward-phase or phase-adaptive
2. Dimmer modules shall be fully rated for loads up to 300W
3. By default, phase-adaptive dimmers shall automatically detect the required dimming mode based on connected loads and lock the mode in at power-up
4. The forward-phase dimmer shall support tungsten/incandescent, 2-wire fluorescent, and magnetic transformer loads
5. The phase-adaptive dimmer shall support tungsten/incandescent, line-drive LED, and electronic transformer loads
6. Panels without available dimmers that support magnetic loads shall not be acceptable
7. The panel shall support a maximum phase dimming load of 7,200W if populated fully with (24) 300W dimmer modules. Panels that do not support phase dimmers and relays combined in a single panel shall not be acceptable

H Relay Panel Accessories
1. A low voltage 0-10V dimming option shall provide up to 24 0-10v control outputs that are linked to relay circuits within the panel. Each output shall support up to 400mA of current sink per output

2. A contact input option shall provide 24 dry contact inputs to be linked for direct or group relay control, to activate a preset, or to activate a sequence. Controller software shall allow for normally open maintained, normally closed maintained, or momentary toggle
3. A DALI control option shall provide 24 control loops of broadcast DALI control, with each loop controlling up to 64 DALI devices
4. A RideThru option shall provide short-term power backup of control electronics by automatically engaging when power is lost, and recharging when normal power is present
5. A tamperproof hardware kit shall be available that provides center reject Torx head screws to prevent access to panel interior by unqualified individuals
6. Main Breaker options shall be available as specified in Section E.6

I Thermal

1. The panel shall be convection cooled. Panels that require the use of cooling fans shall not be acceptable
2. The panel shall operate safely in an environment having an ambient temperature between 32°F (0°C) and 104°F (40°C), and humidity between 5-95% non-condensing

J Approved Products

1. Supply the Following:

Qty	Model	Description
1	ERP-24R1-24B1	120/208V 3Ph Panel w/ 24 1-pole breakers and relays
1	ERP-SMD	Surface Mount Door
2	ERP 1PB 20A	Single Pole 120V 20A Branch Circuit Breaker

2.03 GENERAL NETWORK

A General

1. The network shall provide data distribution over TCP/IP Ethernet networks. Data shall be layer 3 routable. Systems using proprietary formats or formats other than 10/100/100Mbit wired Ethernet or non-layer 3 routable networks shall not be accepted.
2. Connections shall be made between consoles, face panels, architectural processors, dimmers, Net3 Gateways, and computers over standard Ethernet distribution systems using 100BaseT, 100BaseFL, or greater wiring. All installations shall conform to established Ethernet wiring practice, and installation shall be performed by contractors qualified to do this type of work. All wiring shall be tested at Category 5e or higher for full bandwidth operation to the appropriate IEEE standard.
3. The Lighting Control system must be supplied by a single manufacturer and must have seamless integration over Ethernet between the Entertainment and Architectural lighting control.

B Capacities

1. The network shall support DMX routing, patching, and prioritization for up to 63,399 universes (32,767,488 DMX addresses). Each address may be input or output from any port on any DMX gateway in the system. DMX input, routing and output shall be specifically supported on the system from multiple sources and locations up to the maximum number of gateways supported by the Ethernet topology.
2. The network shall support multiple network hosts including consoles, gateways, dimming racks, computers, file servers, printers, and architectural control processors with discrete command lines and control. The lighting network shall

support multiple venues within a system and discrete systems on the same network.

C System Configuration and Monitoring

1. Network device configuration shall be via Net3 Gateway Configuration Editor (GCE) software and/or ANSI E1.17 Architecture for Control Networks (ACN).
2. Patch addresses shall support viewing and manipulation via ANSI E1.17 ACN.
   a. The system shall permit complete user flexibility allowing the system operator to patch each DMX input address to any ANSI E1.31 streaming ACN address, and DMX output to span streaming ACN universes.
   b. The lighting system shall support assignment of DMX offsets, truncation of DMX universes, and provide choice of DMX port prioritization.
   c. The lighting system shall support the DD start code extension to ANSI E1.31 which provides priority per address such that multiple control sources can share universes with discrete control per address.
   d. Lighting systems that do not support the above mentioned address patching capabilities shall not be suitable.
3. The system shall allow assignable labels for all network devices to allow easy identification by system users.
4. Each network device shall have a discrete and unique IP address provided automatically by the software. The user may edit this IP address. Systems that do not support automated IP allocation with IP collision avoidance, and systems that do not allow complete reconfiguration of the above mentioned features over ANSI E1.17 ACN shall not be acceptable.
5. All configuration data for each network device shall be held at the device and system operation shall not require continuous on-line operation of the network configuration software.
6. Lighting console operators shall be able to backup the network configurations in the lighting control console. In the event of a network device failure, the operator shall be able to apply the configuration of the failed device to a replacement device of the same type without manually reentering settings. Systems that do not support configuration backup as described above shall not be accepted.
7. Architectural and Entertainment systems connected to the same network shall be capable of arbitrating control over E1.31 Streaming ACN (sACN) level data. The system shall be capable of alternating control of individual address data between architectural and entertainment systems without intervention by the user. The user shall dictate the conditions under which system shall automatically take control. The network shall allow user override of the selected defaults. Systems which require direct user intervention to allocate control of dimmers between architectural and entertainment lighting systems shall not be accepted.
8. The Net3 network shall allow multiple DMX input sources to be prioritized on the same universe as network native sources using E1.31 Streaming ACN prioritization. Multiple DMX inputs may be assigned to the same streaming ACN address (this provides multi-source control for a particular address). Likewise, the system shall support E1.31 prioritization of multiple simultaneous network sources. Systems that cannot prioritize multiple DMX inputs and multiple native network sources on a network shall not be deemed suitable.
9. The lighting network shall allow each DMX input address to be assigned a priority on the network allowing each DMX control level coming into the system to participate in full arbitration. Addresses with the highest priority shall have control, with lower priority addresses being ignored. Addresses assigned the same numeric priority, between 1 and 200, shall respond in highest level takes precedence (HTP) manor. The network shall require a valid DMX signal present

at the input to initiate prioritization. Systems that do not allow for prioritized HTP for DMX inputs to the network shall not be allowed.

D Operational Features

1. Each DMX gateway shall control up to 512 DMX addresses per port, within the confines of up to 63,999 DMX universes (32,747,488 address). The specific DMX data input or output by the gateway shall be configurable by the user.
2. Duplicate outputs of DMX data (DMX splitter) and discrete outputs shall be fully supported.
3. Merging of multiple DMX input sources on a single gateway without gateway with DMX output on the same gateway shall be supported without connection to the network. The gateway shall support assignment of priority to each input source independently
4. File transmission, synchronization and access to software shall be supported.

2.04 Signal Processing Rack

A General

1. Signal Processing Rack to be delivered fully assembled with internally wiring complete and ready for mounting conduit by EC or as (2) assemblies.
   a. Assembly A- Backpan with any necessary power receptacles and any necessary mounting hardware including DIN rail
   b. Assembly B- Center Section and Door with all equipment fully assembled and prewired to the greatest extent possible.

B Wall Mount Equipment Rack

1. General
   a. The wall mount enclosure to be Middle Atlantic DWR Series or Equal w/ door and rear rack rails.
2. Physical
   a. To be finished in durable black textured powder coat
   c. The Enclosure shall be constructed of three distinct sections
      1) Backpan
      2) Center Equipment
      3) Front Door
   d. The cabinet shall be designed for surface mounting.
   e. Available Depths: 17”, 22”, 26” & 32”
   f. Available heights in rack units to range from
   g. The rack shall accommodate standard EIA 19” equipment
   h. Minimum weight capacity shall be 200lbs.
   i. The rack shall have knockouts for conduit, wiremold, vents, and fans.
   j. The rack should utilize tool free and reversible mounting of the center section to the backpan.
3. Compliance
   a. The cabinet shall be EIA 19” compliant
   b. The cabinet shall be UL listed in the US and Canada
   c. Rack shall be manufactured by an ISO 9001 & ISO 14001 company.

C NETWORK CONTROLS EQUIPMENT

1. General
   a. Provide Managed Ethernet Switches to permit interconnection of node devices, over a conventional 10/100/1000Base-T (twisted pair copper) Ethernet network.

b. Switches shall be designed to fulfill the unique network performance requirements of the Entertainment Technology industry, specifically in their ability to maximize data throughput, and minimize packet latency and dropped packets.
c. Each Managed Ethernet Switch shall incorporate five (24) RJ45-type female receptacles for twisted pair (copper) connectivity.
d. Each Switch shall incorporate one (2) 1000BaseSX SFP for LC Fiber connections.
e. Switches shall be capable of advanced data management of any industry standard Ethernet lighting control protocol and certain commonly used proprietary Ethernet protocols.

2. Ethernet Ports
a. Ethernet ports shall comply with the requirements of the IEEE 802.3 standard.
b. Ethernet ports shall be capable of operating at 10Base-T, 100Base-TX and 1000Base-TX.
c. All Ethernet ports shall be capable of being user configured and monitored.
d. Each Ethernet port shall include an adjacent LEDs to indicate Link Status and Activity status.

3. Configuration
a. Switch identification (name and IP address) and all other configuration shall be accomplished using a personal computer or similar device running a web browser
b. Once configuration is completed, the Switch shall not require a computer to be present on the network for proper operation.
c. All configuration and operational data shall be stored in non-volatile memory.

4. Power-Over-Ethernet (POE)
a. All ports shall be capable of providing power to connected node devices as per the IEEE 802.3af standard.
b. The Switch shall be capable of allocating PoE power in an intelligent fashion so as to make the most efficient use of the available capacity.
c. PoE availability to each port shall be prioritized so that higher-power peripherals can use up to the maximum permitted under IEEE 802.3af.
d. PoE power shall be denied to a newly connected device if its power, based on its PoE classification level, will cause the total PoE power to exceed the maximum.
e. It shall be possible for the user to enable or disable power availability at any port(s).
f. It shall be possible for the user to set the maximum allowable PD (powered device) power classification on a per-port basis.

5. Network
a. Communications physical layer shall comply with the IEEE 802.3 10/100/1000Base-T Ethernet specification. Products offering only 10/100 connectivity shall not be acceptable.
b. All network cabling shall be Cat5e or Cat6 conforming to TIA-568A/B, and shall be installed and certified by a qualified network installer.

D DMX ETHERNET GATEWAY – FOUR PORT

1. General

a. The lighting control gateway shall be a microprocessor-based unit specifically designed to provide DMX-512 control of lighting systems and transport of RDM configuration and status messages. The gateway shall permit DMX-512 data to be encoded, routed over an Ethernet network and decoded back to DMX-512. The unit shall be a Response Mk2 4-port DMX Gateway as provided by ETC, Inc.
b. Gateways shall communicate over Ethernet directly with at least ETC, Inc.' s entertainment and architectural lighting control products and other Ethernet interfaces.
c. Connections shall be made between gateways, consoles, architectural systems, and PCs over standard Ethernet distribution systems using 10/100BaseT.
d. The gateway shall support multiple protocols including:
    1) ANSI E1.17 Architecture for Control Networks (ACN)
    2) ANSI E1.31 Streaming ACN (sACN)
    3) ANSI E1.11 USITT DMX512-A
    4) ANSI E1.20 Remote Device Management (RDM)
e. The gateway shall be tested to UL standards and labeled ETL Listed.
f. The gateway shall be RoHS Compliant (lead-free).
g. The gateway shall be CE compliant.
h. The gateway shall have a graphic OLED display and four buttons for identification (soft-labeling), configuration, status reporting and troubleshooting
    1) Labeling shall be user configurable using ANSI E1.17 Architecture for Control Network (ACN), or a purpose built software configuration tool.
    2) The OLED display shall show DMX port configuration indication as well as indicate the presence of valid signal.
    3) Gateways that do not indicate port configuration (input/output) and valid data shall not be acceptable.
i. Each gateway shall have power and data activity LEDs on the front of the gateway

2. DMX Ports
    a. DMX Ports shall comply with the requirements of ANSI E1.11 USITT DMX512-A standards.
    b. Each DMX port shall be software or locally-configurable for either input or output functionality.
    c. DMX input shall be optically-isolated from the gateway electronics.
    d. DMX Port shall provide at least 500V isolation to ground and the rest of the electronics
    e. Each port shall incorporate one DMX512-A Connection
        1) Gateways shall be available with the following connection options: 5-pin male XLR, 5-pin female XLR, Ethercon RJ-45, or terminal strip for DMX wiring.
    f. Network gateways that do not indicate input/ output port configuration or presence of valid data shall not be accepted
3. Processor
    a. Each gateway shall have sufficient processing power to manage up to 63,999 universes (32,767,488 addresses).

b. Maximum delay time from input to output shall not be greater than one packet time (approximately 22 mSec.).
c. A minimum DMX update rate of 40Hz shall be sustained under all conditions unless specifically configured for a slower rate for the sake of compatibility with 3rd party DMX devices.

4. Mechanical
   a. The Gateway shall be fabricated of 16-gauge steel, finished in fine-texture, scratch-resistant, black powder coat (RAL 9004).
   b. The gateway shall support table top use
   c. The gateway shall support field configuration allowing the Ethernet port to be either on the front or the rear of the unit
   d. Optional accessories for rack-mount and pipe applications shall be available from the manufacturer. These accessories shall support installation by an end-user
5. Power
   a. Power for the gateway shall be provided over the Category 5 (or better) cable, utilizing IEEE 802.3af compliant Power over Ethernet (PoE). Power consumption using shall not be greater than 7 watts.
   b. An optional low-voltage DC power input shall be available utilizing an isolated in-line power supply capable of an operating range of 12-24VDC. The Power supply shall be provided by the gateway manufacturer.
   c. The gateway electronics shall be electrically isolated from the power supplied over the Category 5 (or better) cable.
6. Configuration
   a. The Gateway must support local or remote configuration.
   b. Each gateway on the network shall be individually configurable using freely available software configuration tools. The primary configuration tool shall be Net3 Concert configuration software running on a network connected PC. The PC shall only be required for configuration, and shall not be required for normal operation of the system.
   c. Each port of the DMX gateway shall control up to 512 DMX addresses, within the confines of 63,999 universes.
   d. The specific DMX data input or output by the gateway shall be freely configurable by the user.
   e. Duplicate outputs of DMX lines (DMX splitter) and discrete outputs shall be fully supported.
   f. Multiple DMX universes may be configured with any length up to 512 total addresses. Any range of DMX input addresses shall support selection and routing to the specified sACN output.
   g. Multiple sACN sources may be combined with a priority may be assigned to each source sending data to the gateway
   h. All relevant routing information shall be stored in non-volatile memory at each gateway. The system shall recover from a power outage without requiring the PC to be online. Gateways that do not support non-volatile storage of data routing shall not be accepted.
7. Network
   a. Communications physical layer shall comply with IEEE 802.3i for 10BASE-T, 802.3u for 100BASE-TX and 802.3af for Power over Ethernet specifications
   b. All network cabling shall be Category 5 (or better), conforming to TIA-568A/B, and shall be installed by a qualified network installer.

c. Data transport shall utilize the TCP/IP suite of protocols to transfer the DMX data.
d. ANSI E1.17 Architecture for Control Networks (ACN) and streaming ACN (sACN) shall be supported. Gateways that do not support ANSI E1.17 shall not be acceptable.
e. Each DMX gateway shall control up to 512 DMX addresses, per DMX port within the confines of up to 63,999 universes (32,767,488 addresses) using Streaming ACN (sACN).
1) Any range of DMX addresses may be selected for each universe.
2) Multiple sources shall be supported by prioritized Highest Takes Precedence (HTP with priority). Each source shall support assignment of priority to allow override of default HTP behavior.
3) Each DMX port shall support its own universe and start address.
f. Gateways shall have built in DMX merger capability on a universe or channel-by-channel basis.
g. Gateways shall support have built in priority on a per-universe or channel-by-channel basis. Gateways that do not support prioritized merging of multiple network sources at independent priorities shall not be accepted.

8. Environmental
a. The ambient operating temperature shall be 0° to 40°C (32° to 104°F).
b. The storage temperature shall be -40° to 70°C (-40° to 158°F).
c. The operating humidity shall be 5% - 95% non-condensing.

9. Accessories
a. Hanging bracket kit shall allow unit to be mounted in three orientations
1) U-Bolt or C-Clamp mounting hardware shall be available
b. One E.I.A. rack space mounting bracket kit shall support either one or two complete units and allow for up to eight ports of DMX
c. Front Access Panel kit shall allow the connectors on the rear of the gateway to be accessed from the front of an equipment rack. Options for 5-pin XLR style connectors that support DMX input or output shall be available
d. A Universal Power Supply with international plug-set shall be available. Multiple power supplies shall be able to fit in a vertically stacked power strip.
e. ETC Net3 Concert Configuration and monitoring Software

E DMX ISOLATED OPTO-SPLITTER

1. General
a. The DMX/RDM splitter shall be a solid-state device specifically designed as an optically isolated DMX512 Opto-splitter. The Opto-splitter shall permit DMX512 data to be received and repeated out to multiple ports. The unit shall be a Response Opto-splitter as provided by ETC, Inc.
b. The splitter shall support multiple protocols including:
1) ANSI E1.11 USITT DMX512-A
2) ANSI E1.20 Remote Device Management (RDM)
c. The splitter shall be tested to UL standards and labeled ETL Listed.
d. The splitter shall be RoHS Compliant (lead-free).
e. The splitter shall be CE compliant.
f. There shall be visual indicators on the splitter showing status of the DMX Opto-splitter and its interfaces

2. Mechanical

a. There shall be two form factors available
   1) Rack-mount:
      a) The Opto-splitter shall be fabricated of sheet aluminum, finished in fine-texture, scratch-resistant, black powder coat (RAL 9004).
      b) The Opto-splitter shall support field configuration allowing the connectors to be either on the front or the rear of the unit
      c) The Opto-splitter shall support field configuration allowing the power connector to be either on the front or the rear of the unit
   2) DIN rail:
      a) The DIN Rail mounted Opto-Splitter shall be included in an extruded plastic enclosure.
      b) Enclosure and mounting shall comply with DIN43880 and EN60715(35/7.5) respectively.
b. The unit shall be entirely solid-state with no moving parts or fans.
c. Optional mounting accessories shall be available from the manufacturer. These accessories shall support installation by an end-user

3. DMX Ports
   a. DMX Ports shall comply with the requirements of ANSI E1.11 USITT DMX512-A standards.
   b. The Opto-splitter shall have DMX input and thru ports that are optically-isolated from the output ports.
   c. DMX Port shall provide at least 500 V isolation to ground and the rest of the electronics
   d. All transceiver chips shall be socketed allowing for field replacement. A spare transceiver chip shall be provided with each unit.
   e. Opto-splitters shall be available with the following connection options:
      1) Rack-mount
         a) 5-pin female XLR (12 ports)
         b) RJ45 (16 ports)
         c) Terminal strip for DMX wiring (16 ports)
      2) DIN rail
         a) Terminal strip for DMX wiring (8 ports)
4. Power
   a. Power for the Rack-mount Opto-splitters shall be 100–230 VAC at 50 or 60 Hz, supplied via a detachable power cord. Power consumption shall not be greater than 35 watts.
   b. Power for the DIN rail Opto-splitters be 12-48 VDC. Power consumption shall not be greater than 8 watts. Wiring connections use pluggable rising clamp terminals
5. Environmental
   a. The ambient operating temperature shall be -10° to 65°C (14° to 149°F).
   b. The storage temperature shall be -40° to 70°C (-40° to 158°F).
   c. The operating humidity shall be 5% - 95% non-condensing.
6. System Requirements
   a. Provide the quantity and type of Opto-splitters required, as scheduled. Opto-splitters shall be as manufactured by ETC Inc. of Middleton, WI.

F DIGITAL INTERFACE STATIONS

1. DMX Playback Controllers
    a. General
        1) The DMX playback controller be the Echo DMX Scene Controller by ETC, Inc., or equal.
        2) The scene controller shall allow for control of DMX lighting through:
            a) DMX input for snapshot capture of lighting presets
            b) Live control of intensity, hue and saturation of patch DMX Zones from connected stations and mobile apps
        3) The scene controller shall support 32 Presets of 512 DMX Addresses
        4) The scene controller supports control of 16 patched DMX zones
    b. Mechanical
        1) The DMX scene controllers shall be DIN-Rail Mounted on DIN 43880 (35/7.5) rail
        2) The DMX scene controllers shall be constructed of injection-molded black ABS plastic that fully encloses all electrical components
        3) The DMX scene controllers shall support onboard mode and termination configuration using toggle switches
        4) The DMX scene controllers shall have LED indicators for status of
            a) Blue colored indicator for power
            b) Bi-color DMX activity indicator
    c. Electrical
        1) Control station wiring shall be EchoConnect control wiring utilizing low-voltage, Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
        2) The station shall use (2) #16 AWG stranded wires for 24vDC operating power.
        3) Station wiring shall be topology free. It may be point-to-point, bus, loop, home run or any combination of these. Stations that require daisy-chain wiring shall not be acceptable.
        4) DMX Port shall comply with the requirements of ANSI E1.11 USITT DMX512-A standards.
        5) DMX input shall be optically-isolated from the gateway electronics.
        6) DMX output shall be earth-ground referenced.
        7) DMX Port shall be capable of withstanding fault voltages of up to 250vAC without damage.
        8) DMX Ports shall be eight-position removable connectors supporting Belden 9729 (or equivalent) or Category 5 Ethernet wiring
        9) Stations shall support a MicroSD card slot for firmware maintenance
        10) Stations shall be UL/ cUL LISTED and CE marked
    d. Functional
        1) The scene controller shall support recall of prerecorded scenes for playback using DMX
        2) There shall be support for 32 presets
        3) The scene controller shall support preset playback as activated by any connected control station
        4) The scene controller shall support DMX pass-through for real-time output of incoming DMX levels.

5) The scene controller shall support live control and recording for multiple DMX fixture profiles.

G DIGITAL INTERFACE STATIONS

1. System Expansion Module
   a. General
      1) The system expansion modules shall be the Echo Expansion Bridge (EEB) by ETC, Inc., or equal
      2) The Expansion Bridge shall allow for the following features:
         a) Connection of a third party wireless access point to allow for wireless (Wi-Fi) connection of the EchoAccess Mobile App to the Echo Control System
         b) Combination of up to four Echo segments to create a larger integrated Echo system
         c) Communication with a Unison Paradigm Architectural Control Processor to allow for control interaction and indication of the comprehensive control system
   b. Mechanical
      1) The Echo Expansion Bridge shall be DIN-rail mounted on DIN43880 and EN60715 (35/7.5) compatible rail
      2) The Bridge shall be constructed of injection-molded, black ABS plastic that fully encloses all electrical components
      3) The Bridge shall have a backlit display for identification, status reporting and configuration
      4) The Bridge shall have buttons for up, down, back and enter for use with the backlit display
      5) The Bridge shall have a hard reset button accessible on the front panel
      6) The Bridge shall have LED indicators:
         a) Power Status - Blue
         b) Network Status - Green
   c. Electrical
      1) The Expansion Bridge shall have an RJ45 Ethernet port for connection to a network that supports additional lighting control products
      2) The Bridge shall have four EchoConnect connection terminals
         a) Control wiring utilizing low-voltage, Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
         b) Control wiring shall be topology free. It may be point-to-point, bus, loop, home run or any combination of these. Control products that require daisy-chain wiring shall not be acceptable.
      3) The station shall use (2) #16 AWG stranded wires for 24vDC operating power when not utilizing Power over Ethernet (PoE).
      4) The Bridge shall support a MicroSD card for firmware maintenance
      5) The Bridge shall be UL/ cUL LISTED and CE marked
      6) The Bridge shall be FCC Compliant
   d. Network

1) Communications physical layer shall comply with IEEE 802.3i for 10BASE-T, 802.3u for 100BASE-TX and 802.3af for Power over Ethernet specifications
2) All network cabling shall be Category 5 (or better), conforming to TIA-568A/B, and shall be installed by a qualified network installer
3) Switches shall comply with power-over-Ethernet IEEE802.3af, unless a separate in-line power supply is provided

e. Environmental
1) The ambient operating temperature shall be 0° to 50°C (32° to 122°F)
2) The operating humidity shall be 5% to 95% non-condensing

f. Functional
1) Connection to EchoAccess Mobile Application
a) The Expansion Bridge shall facilitate communication from an Echo control system to a wireless access point
b) The EchoAccess Mobile Application shall connect to the wireless access point and send control and configuration commands to the Expansion Bridge for communication to all connected Echo Products
2) Creation of larger Echo control systems
a) The Expansion Bridge shall allow up to four Echo control segments to be merged together
b) Each Echo segment must contain an EchoConnect Station Power Supply
c) The following system maximums shall be supported per bridge:
i. Sixty four (64) Stations, Sensors and Control Interfaces
ii. Sixty four (64) Power Control and Output Products
iii. Sixteen (16) Control Spaces
iv. Sixteen (16) Control Zones per Space
3) Connection to a Unison Paradigm Architectural Control Processor (P-ACP)
a) The Expansion Bridge shall communicate to a Paradigm Architectural Control Processor using an Ethernet Network
b) Up to sixteen (16) Bridges shall be able to connect to a single (P-ACP)
c) Up to 128 Bridges shall be able to connect to a single Paradigm Projects
d) Paradigm systems shall be able to control and indicate status of the following Echo control properties
i. Echo Zones
ii. Echo Presets
iii. Echo Space Combine
iv. Echo Space Lockout

H Uninterruptible Power Supply
1. General
a. Rack mount Uninterruptible Power Supply to condition power to network equipment and architectural control equipment as well as supply power for short term power outages. Not to be for emergency power.

2. Physical
   a. Unit shall be rack mountable
   b. Unit shall fit in a EIA standard 19” equipment rack and not to exceed a 2 rack unit height
   c. Unit shall not exceed 36lbs
   d. Unit shall not exceed a minimum rack depth of 15.5”
   e. Housing shall be steel construction with durable black finish.
   f. Unit dimensions shall not exceed 3.45”Hx17.35”Wx12.5”D
3. Functional
   a. Unit shall have a front panel LCD for information and configuration including operating mode and alarm function.
   b. Three pushbutton switches on front panel
      1) Power Off/On
      2) Mode Select
      3) Mute/ Enter for control functions
   c. Audible alerm to indicate start-up, power-failure, low-battery, and overload.
4. Electrical
   a. Input
      1) Molded Nema 5-15 connector on 10ft cord
      2) Circuit Breaker Rated for 15A
      3) Rated voltage: 120V single phase
      4) Maximum current: 9.2A
   b. Output
      1) 1000VA capacity
      2) 800W with a Power Factor of .8
      3) Line Mode Voltage Regulation Range: -21%-+8%
      4) Battery Mode Voltage Regulation Range: +/-5%
      5) (6) 5-15R output receptacles
   c. Battery
      1) Full Load Runtime: 5.3min
      2) Half Load Runtime: 15 min
      3) Shall be hot-swappable and user replaceable
5. Thermal
   a. AC Mode BTU/Hr Maximum: 134
   b. Battery Mode BTU/Hr Maximum: 600
   c. Operating Temperature Range: 32°-104° Fahrenheit
   d. Active Cooling by fan not to exceed 45dBA

I Approved Manufacturers and Products

1. Approved Manufacturers:
   a. Pathway
   b. Electronic Theatre Controls
   c. TrippLite
   d. Cisco
2. Integrator responsible for any internal components not listed that are necessary for a fully functional system.
3. Supply the Following:

Qty	Model	Description

1	DWR-##-22PD	Wall Mount Rack with Plexi Door
1		Integrator Identification Panel with Support Information
1	SG300-24PP	24 Port POE Switch
1	BR1	Cable Management Panel
1		24 Port Patch Panel
1	LT-1R	Rack Light
1	UPS10002U	1000VA UPS
1	EDMXC	Echo DMX Scene Controller
1	EEB	Echo Expansion Bridge
1	RSN-DMX4-DIN	4 Port DMX Gateway
1	RSN-OPTO-8DIN	8 Way Opto Spitter

2.05 BUTTON STATION

A General

1. The Button station shall be the Echo Preset Button Station as manufactured by ETC, Inc., or equal. It shall be a remote station on an EchoConnect network that can play presets stored in an Echo output product.
2. The station shall consist of a dual function (program/play) push-button with an integral LED for each corresponding preset
3. Standard stations shall control 5 or 10 presets. If control of more than 10 presets is required, multiple stations shall be provided.
4. The system shall support up to sixteen stations when used with an additional power supply.

B Electrical

1. Button station wiring shall be EchoConnect control wiring that shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
2. The station shall operate on class 2 voltage provided by the control system via the EchoConnect network.
3. Station wiring must be topology free. It may be point-to-point, bus, loop, home run or any combination of these.
4. Wiring termination connectors shall be provided with all stations.

C Station Addressing

1. Preset addressing for stations shall be via two 16 position rotary dials and will be set by installers or factory personnel. Multiple stations with different button quantities may have "overlapping" preset addresses.
2. Each station shall support preset recall in a single space.

D Play Presets

1. Pressing a button shall play the corresponding preset. The station will send the command to play the preset to all output products.
2. Each station shall monitor the status of presets. If any looks are active in the range of the station's numbered preset, the station shall illuminate the corresponding LED regardless of which device activated the preset.
3. If the button with the active preset (LED lit) is pressed, the station shall send the command to return to normal operation, deactivate the preset and turn off the LED.

E Physical

1. Control station electronics shall mount directly behind the faceplate. The entire assembly shall mount into a single gang back box. Back boxes for the flush mounted stations shall be industry standard back boxes. The manufacturer shall supply back boxes for surface mounted stations.

2. Station faceplates shall be constructed of ABS plastic and shall use no visible means of attachment. All Button stations shall be available with white, signal white, ivory, gray or black faceplates and buttons.

F Approved Manufacturers and Products

1. Approved Manufacturers:
   a. Electronic Theatre Controls
   b. Pathway Connectivity
2. Supply the Following:

Qty	Model	Description
	E1002-4	2 Button Echo Station- Black- Qty per plans

2.06 Touchscreen Control Stations

A The Touchscreen Control Stations shall be the Unison Echo EchoTouch Controller Mk2 as manufactured by ETC, Inc., or equal.

B General

1. The Touchscreen protocols station shall provide control of up to 512 networked addresses or up to 512 local DMX addresses on a maximum of eighty (80) control zones. Addresses may be distributed using DMX512-A or via sACN or Art-Net Ethernet-based lighting
2. The Touchscreen station shall operate using graphic buttons, faders and other images on at least 7 user programmable control pages
3. Touchscreen stations shall support default and fully graphical control pages
4. The Touchscreen shall integrate with ETC Unison Echo Controls

C Mechanical

1. Touchscreen stations shall consist of a seven-inch, backlit liquid crystal display (LCD) with a minimum resolution of 800 by 400 pixels with a capacitive multi-touch interface
2. Touchscreen bezels shall be constructed of cast aluminum finished in a fine texture powder coat.
   a. Touchscreen shall be available in four standard colors
      1) Cream (RAL 9001)
      2) Gray (RAL 7001)
      3) Black (RAL 9004)
      4) Signal White (RAL 9003)
   b. The bezel shall have no visible means of attachment
3. Touchscreen stations shall support surface, flush and rack mounting options
   a. Flush-mount to industry standard 3-gang back box
   b. Surface back box dimensions shall be 7.35 in/187 mm wide x 4.88 in/124 mm high x 3.5 in/89 mm deep and available from the manufacturer
   c. Rack mounting options shall fit in standard 19" racks an shall be no taller than 3 EIA rack units

D Electrical

1. The Touchscreen shall have an RJ45 Ethernet port for connection to a lighting system and for Power over Ethernet (PoE)
2. The Touchscreen shall have an EchoConnect connection terminals
   a. Control wiring utilizing low-voltage, Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit)

b. Control wiring shall be topology free. It may be point-to-point, bus, loop, home run or any combination of these. Control products that require daisy-chain wiring shall not be acceptable

3. The Touchscreen shall use (2) #16 AWG stranded wires for 24 VDC operating power when not utilizing Power over Ethernet (PoE)
4. The Touchscreen shall have typical power draw of 400mA
5. The Touchscreen shall have a USB type A connector for firmware maintenance
6. The Touchscreen shall be cULus Listed and CE Compliant
7. The Touchscreen shall be FCC Compliant

E Network

1. Communications physical layer shall comply with IEEE 802.3i for 10BASE-T, 802.3u for 100BASE-TX and 802.3af for Power over Ethernet specifications
2. All network cabling shall be Category 5 (or better), conforming to TIA-568A/B, and shall be installed by a qualified network installer
3. Switches shall comply with power-over-Ethernet IEEE802.3af, unless a separate in-line power supply is provided

F Functional

1. System
   a. A maximum of 64 presets shall be contained in non-volatile electronic memory
   b. A maximum of 4 internal sequences. Sequences shall record user-selected zone levels
   c. The Touchscreen shall be equipped with an on-board help system
   d. The Touchscreen software upgrades shall be made by the user via USB drive. Changing internal components shall not be required
   e. The Touchscreen shall provide a USB port allowing show data to be saved for archival or transfer to other consoles or a personal computer
   f. Systems that do not provide the above capabilities shall not be acceptable
2. Patching
   a. The Touchscreen shall provide patching facilities for dimmers and multi-parameter devices via a built in library of fixture definitions. The fixture library shall be updated via software based updates. It shall be possible to create custom fixture definitions using an offline application
   b. The Touchscreen shall support patching, address setting, and mode changes using Remote Device Management (RDM) on the local DMX/RDM port
3. Playback control
   a. Customizable zone display using Zone Map. It shall be possible to rearrange the graphical representations for control channels to closely mimic the positions of fixtures in the installation
   b. Seven users customizable interactive pages
   c. Color and white pickers
   d. Touch-based parameter controls with reference based palettes
   e. Virtual level wheel
4. Layout and configuration
   a. It shall be possible to view and modify the layout of the users pages
   b. It shall be possible to add, remove or edit the following items:
      1) Preset Buttons
      2) Off Buttons

3) Sequence Buttons
4) Zone and space modifier buttons
5) Space combine buttons
6) Zone Fader

c. There shall be three options for inactivity
1) Dim screen to level
2) Turn screen off
3) Display user chosen inactivity image

d. It shall be possible to have multiple configurations stored within an LCD Station

5. TimeClock
a. The Touchscreen shall have a built-in astronomical and real time event engine allowing the activation of presets and sequences
1) The system shall support 80 events.
2) The system shall support astronomical, real-time and manual control events in up to 16 control spaces.

b. Timed events shall be programmable via the Touchscreen
1) TimeClock events shall be assigned to system day types. Standard day types include: everyday, weekday, weekend and day of the week.
2) TimeClock events shall be activated based on sunrise, sunset, time of day, open and closed events and a configurable state based engine.
3) The TimeClock shall automatically compensate for regions using configurable daylight saving time.
4) Presets shall support assignment to events via the TimeClock user interface.

c. Timed events shall resume automatically after power loss
d. The Touchscreen shall support timed event hold

G Approved Manufacturers and Products
1. Approved Manufacturers:
a. Pathway
b. Electronic Theatre Controls
2. Supply the Following:

Qty	Model	Description
2	ETS-4	Echotouch MK2 Controller- Black

2.07 Lighting Console and Accessories

A General
1. The lighting control console shall be a microprocessor-based system specifically designed to provide complete control of stage, studio, and entertainment lighting systems. The console shall be the Element 2 as manufactured by Electronic Theatre Controls, Inc., or equal.
2. The system shall provide control of either 1,024 or 6,144 outputs on a maximum of 32,768 control channels, which may be any number from 1 to 99,999. Output shall be distributed over a 10/100 MB Ethernet network using Net3/ACN, ETCNet2, Avab and/or Artnet (multi-cast) protocols. The user shall be able to control the application of protocols at an individual address level.
3. The system shall support full bi-directional RDM communication with compatible devices via Net3 DMX/RDM Gateways. RDM communication shall adhere to

ANSII standard E1.20-2006 Entertainment Technology – RDM – Remote Device Management Over DMX512 Networks. Supported RDM features shall include:

a. Discovery and Identification of RDM capable devices
b. Setting of start addresses, operating modes and additional settings as exposed by connected devices and controllable via RDM
c. Viewing of Sensor data as provided by connected devices
d. Error reporting as provided by connected device

4. A maximum of 10,000 cues, 1000 groups, 1000 presets, 4 x 1000 palettes (Intensity, Focus, Color and Beam), 99,999 macros, 1000 effects, 1000 curves, 1000 Color Paths and 1000 snapshots may be contained in non-volatile electronic memory and stored to an onboard solid-state hard drive or to any USB storage device.
5. Channels shall respond to cue information by last instruction with discrete rate control provided for all cues. The console may be placed in Tracking or Cue Only mode by the user as a system default and overridden on individual record actions as required. HTP/LTP intensity flags, block, proportional, intensity master or manual master fade control. Priority and Background Priority may be placed on the cue list. It shall also be possible for a cue list to contribute to playback background states or to withhold such contributions.
6. A Master Playback fader pair shall be provided. The fader pair may execute crossfades or all-fades, with IFCB cue level timing,
7. The console shall provide 40 pageable faders that may be operate in either LTP channel or fader mode. Virtual fader control for playbacks is also provided.
8. A high-resolution level wheel shall be provided to control intensity for selected channels and scrolling within selected displays. A high-resolution rate wheel, which may also be used for fader paging shall be provided.
9. Virtual moving light controls shall provide mouse/touch-based tools for all parameters. The tools shall display the current value for each parameter and provide controls for adjusting each parameter.
10. Control and programming features for automated fixtures shall also include: a standard library of fixture profiles, the ability to copy and edit existing profiles and create new profiles, patch displays including channel and output addressing, 16-bit fade resolution, color characterization allowing color in up to six different color spaces.
11. System information, including playback status, live output and blind values for all record targets shall be displayed on a maximum of two external high resolution monitors, which may also be multi-touch touch-screens. Every display shall support three user-definable workspaces. Each of these workspaces shall provide individually configured frames, with size/scaling controls. Any Windows 7 compatible display may be used.
12. A context sensitive on-line Help feature shall explain and provide an example of the operation of each feature of the system. This help system shall be integrated into the on-board user manual via hyperlinks. Optional dynamic prompts are also provided.
13. A fully integrated Virtual Media Server feature shall allow user to map images and animations to a rig array. 40 such maps may be created, each with 12 layers. System that rely on external hardware or software for this functionality shall not be acceptable.
14. User-definable, interactive displays may be created. These displays, which can be used in live and blind operating modes, allow graphical layout of channels, desk buttons and programming tools. Standard symbols are provided, and the user may import their own symbols or graphics. Each symbol may be individually

defined with data feedback characteristics. Non-interactive status information, such as a mirror of other user' s command lines, may also be included in the display. A graphical browser is provided for fast selection of these views. Multiple zoom factors and placements may be stored and recalled for each display.

15. A detachable alphanumeric keyboard shall be optional. The keyboard shall allow labeling of all show content. An integrated virtual alphanumeric keyboard shall be provided.
16. Console software upgrades shall be made by the user via flash drive. It shall be possible to install software updates in all consoles, processor units and remotes from one device over the network.
17. The console operating software shall be loaded into program execution memory from the internal hard drive when the console is powered. In the event of an uncontrolled shutdown, the console shall return to its last output state when power is restored. Devices requiring a UPS to provide such protections shall not be acceptable.
18. Integrated dimmer monitoring features shall be provided to allow indication of dimming system status, error states and dimmer load monitoring. Adjustment of dimmer configuration from the console shall also be supported. Communications with the dimming system shall utilize ANSI E1.17 2006 - Entertainment Technology - Architecture for Control Networks.
19. Integrated RDM device features shall be provided. The console shall discover and patch RDM devices. The console shall monitor RDM devices to allow indication of RDM device online/offline status error states. The console shall be capable of changing settings of RDM devices such as the DMX start address. Communications with the RDM devices shall utilize ANSI E1.20 2006 – Remote Device Management.
20. Network configuration tools shall be provided from within the desk.
21. Show data may be created and modified on a personal computer, using either Windows 7 or higher or a Macintosh platform running OS 10.11 or later via a free offline editing application. The program shall run natively on Apple operating systems. Applications requiring PC emulation programs shall not be acceptable.
22. A PC, using either Windows 7 (or higher), or a Macintosh running OS 10.11 (or later) using the offline software application shall be able to connect to a control system via the network and view or modify current show data in an independent display environment, using an ETCnomad key. When connected without the key, the computer shall operate in Mirror Mode, with the device to be mirrored selectable by the user.
23. Synchronized backup shall be provided via another full console on the network, an ETCnomad/Puck, or by use of a remote processor unit. The backup device shall maintain synchronized playback with the master and shall take over control of the lighting system upon loss of communication with the master.
24. A maximum of 99 users may access and interact with show data simultaneously. Each user shall have an individual workspace. User identification may be assigned to more than one control device, allowing users to work in tandem, or allowing a designer/ALD to mirror the current display format, mode and command line of the associated programmer. Partitioned control allows discrete control of channel/parameter groupings by user. Partitioned control may be easily enabled and disabled with no need to merge show data from multiple users.
25. The system shall support up to 32 individual simultaneous Time Code inputs or Event lists using Show Control Gateways.
26. Systems that do not provide the above capabilities shall not be acceptable.

B Controls and Playback

1. Manual Control and Programming Section

a. The console keyboard shall be grouped by function. Major groupings shall be record target functions, numeric keys, level assignment functions, display navigation functions and controls, as well as non-intensity parameter controls.
b. The command keypad shall be fully interactive with direct selects and other virtual controls, which provide "one touch" selection of channels, groups, palettes, presets, effects, snapshots and macros.
c. Non-intensity parameters may be set numerically via an extensible keypad. This control shall be fully interactive with the moving light controls. The controls shall also access available modes for each parameter type, min and max values for each parameter as applicable, as well as home position on a parameter basis.
d. Only those parameters available for control in the active lighting system shall be displayed for control. Displays shall condense or lowlight parameters not available to selected channels.
e. Lamp controls provide direct access to luminaire functions such as striking and dousing arc lamps and calibrating entire fixtures or individual mechanisms of fixtures, as provided by the luminaire manufacturer. User access to these features is normalized across all manufacturers for ease of use. Use of a "control channel" for accessing these functions shall not be required and systems requiring use of control channels for these functions shall not be acceptable.
f. Fan functions shall be provided both via command line operation and through encoder controls.
g. Highlight shall be supported, with user definable highlight values. Lowlight conditions may be defined for selected, but not specified channels. Rem Dim commands, at specific levels by channel, may be optionally and automatically called with the highlight command.
h. Advanced color control functions provide color mixing in any of six different color spaces. Gel matches are provided via gel picker or by command line control. Tinting tools allow adjusting the color mix irrespective of the native mixing system. Spectrum tools support adjusting the output of additive color systems with more than three emitter types, allowing the X/Y coordinate to be held while adjusting the recipe that achieves that mix. Color Path tools allow the user to control the live fade of fixtures through the color space.
i. The Virtual Media Server function shall allow the user to create layouts of devices, identified as pixel maps. Media content (images, movies, text and procedurally generated effects) may then be applied, manipulated and stored. Stock content is provided and the user may import his own imagery and animations.
j. Macros may be set to run as default. Default macros called manually hall post to the command line, but executed via cue lists shall run in the background. The user may override this behavior by defining the macro to always execute in the foreground or background, regardless of the recall method. Startup, Shutdown and Disconnect macros may also be defined.

2. Playback Section
a. The playback faders shall consist of a 100mm Master Fader pair with associated control buttons as well as 40 45mm faders which may be placed in channel or playback mode.
b. Virtual fader controls are also available for playbacks.

c. It shall be possible to instantaneously halt an active cue, back to the previous cue, manually override the intensity fade or manually override the entire fade.

d. It shall be possible for a cue list to contribute to the background state or for the contents to be withheld from such. Priority and background priority states may be established.

3. Channel/Playback Faders

a. Up to 999 proportional, fully overlapping additive or inhibitive submasters may be defined. Submasters shall have colored LEDs to indicate submaster status. Each submaster may have fade up, dwell and down fade times. Submasters may be set to priority and background priority status.

b. Submasters may be set to HTP or LTP intensity. Non-intensity parameters on submasters shall be LTP only.

c. Exclusive mode for a submaster shall prohibit the live contribution of that submaster from storing to cues or other submasters. Shield mode prohibits access of associated channels from any other playback or manual control operations.

d. A submaster potentiometer may be defined as proportional, master only or intensity master. When set as an intensity master, a mark and unmark feature is supplied.

e. The submaster blind buffer shall be linked directly to live playback.

f. It shall be possible to set submaster values directly from the command line.

g. Submasters may be set to fade to background or to minimum value when the fader is returned toward zero.

h. Submaster values may contribute to the background state or withheld from such.

i. Presets and IFCB palettes may be mapped to playbacks, either individually or in user defined groupings.

j. Channel mode shall allow the user access to the first 120 channels, operating in LTP logic. Faders that are not currently set to the same level as the corresponding channel must be matched to that level before gaining control. Physical channels may be cleared without impacting output using Sneak.

4. Grand Master Faders

a. The location of the Grand Master shall be user definable. The grand master shall have associated blackout and blackout enable buttons.

b. Blackout shall send all associated intensity outputs to zero. Non-intensity outputs shall not be affected. It shall be possible to exclude channels from Blackout and Grand Master control.

C Display Controls

1. Format shall change the view of selected displays.

2. It shall be possible for the user to choose which parameter categories or parameters (s)he wishes to display.

3. Flexichannel modes shall change which channels are viewed in selected displays, as follows:

a. No modes

b. Masters only/cells only

c. Use Partitions

4. Flexichannel states shall change which channels are viewed in selected displays, modified by the modes, as follows:
    a. All channels
    b. Patched channels
    c. Show channels
    d. Active/Moved channels
    e. Selected channels
    f. Manual Channels
    g. View channels (user identified list)
    h. Channels with discrete timing
5. Expand shall extend the selected view sequentially across connected displays, vertically or horizontally.
6. [Time] depressed shall display discrete timing data. [Data] suppressed shall display absolute values of referenced data. These functions may be latched.
7. Displays may also be toggled to show stored data currently manually overridden, the source of the current parameter data, output level, patch assignment, part structure and referenced marking data.
8. Playback status displays are provided with a variety of different formats. Indications are provided per cue for live moves (lights fading from zero and also moving non-intensity parameters) and dark moves (inactive lights which have stored non-intensity parameter moves).
9. Display content including which of the workspaces is in focus on any of the external monitors and what views are docked in those workspaces may be instantly recalled using snapshots.

D Operating Modes

1. Live Mode
    a. Channel lists may be constructed using the +, -, and Thru keys as well as the direct selects. Channel selection and deselection is fully interactive, regardless of the method used.
    b. Levels may also be set with the keypad, level wheel and non-intensity encoders. "Selected" channels shall be those last addressed and under keypad control. Controls are provided for single button access to the last selected channel list, all channels with manual levels and all active channels.
    c. Channels may be set at a user defined default level using the Level key. +% and -% keys adjust channels quickly by user definable values.
    d. Channels and/or channel parameters may be captured. Capture mode shall allow the user to selectively capture channel data at specific levels. Captured data shall be indicated on the Live display.
    e. Sneak shall be used to restore specified channels to background states, default values, or to send them to specified values, in user specified times.
    f. Selected channels may be set at a level or held to current values while all other channels are set to zero using Rem Dim. Toggling Rem Dim shall restore all unselected channels to original levels. The Rem Dim level shall be user definable via the command line or with a default setup value.
    g. Channels may be recorded into groups for fast recall of commonly used channels. 1000 groups shall be available. Groups shall store selection order. The Offset function supports rapid creation of ordered groups, including reverse and random order.

h. Parameter settings may be stored to Intensity, Focus, Color and Beam Palettes and to Presets. All referenced data may be stored to whole numbers or to up to 99 decimal places between each whole number.

i. The following conditions may be placed on a channel or channel parameter to be included with a cue record action.
   1) Discrete fade time and/or delay
   2) Block flag
   3) IFCB Filters, which may be set at a parameter level.
   4) Release and Restore

j. Cues may be recorded in any order. Up to 99 decimal cues may be inserted between any two whole number cues. Each cue may contain a maximum of twenty parts.

k. It shall be possible to record cues and cue parts with the following information:
   1) Any collection of channel data, as determined by the use of "Record", "Record Only" or selective store commands, combined with parameter filters.
   2) Cue Level timing and delays for Intensity Up, Intensity Down, Focus, Color and Beam.
   3) Follow or hang time
   4) Link instruction
   5) Loop value
   6) Block, Preheat, and/or Mark Flag
   7) Curve
   8) Label and note
   9) Execute list to trigger other activity

l. Non-intensity channel parameters may be preset to an upcoming position using Automark. Automark shall set any stored parameter transitions in the cue just prior to intensity becoming active. Automark may be disabled on a cue or cue part basis, enabling a "live" move. .

m. Any channel parameter may be stored with an effect instruction. These effects may contain relative offsets from current value, or absolute instructions. Effects may be progressive action or on/off states. Entry and exit behaviors shall modify the channel parameters activity when beginning and ending the effect.

n. Update may be used to selectively add modified parameter data quickly to that parameter' s current source. Update may be specified to modify referenced data content or break the link to that content. A dialogue informs the user of the content that will be updated. A trace command may be used to modify the data to the original source of its move instruction. It shall be possible to update inactive record targets.

o. Recall From quickly pulls specified data from record targets or other channels into the current view.

p. Copy To quickly copies selected data to specified channels or other record targets.

q. Address and channel check functions shall be provided.

r. Channel parameters may be "parked" at levels. Those levels are not added to any live record operations, nor may they be changed until the parked element is "unparked". Scaled park provides real time proportional adjustment of stored intensity values. Address Park shall also be provided.

s. About shall provide detailed status of selected channels or specified record targets. This shall include current source, current value, discrete timing, parked value, marked to and for indications. Background levels and current DMX output are also displayed. Channel usage indicates submaster and cue information and also provide a "dark moves" report on a per channel basis.

t. 1000 snapshots may be stored which instantly recall specified front panel and display configurations.

u. Live data may be displayed in a summary view or detailed table orientation.

v. Query shall allow selection of channels by their current or possible state. Keywords and fixture types shall allow quick access to fixtures.

w. User definable home positions, on a per channel basis, may be defined.

x. Channel level offset commands provide channel ordering and sub-grouping functions.

y. Undo shall be used to sequentially step back through manual operations or to undo record and delete actions. It shall be possible to undo multiple commands in one action.

2. Blind

a. The Blind display allows viewing and modification of all record targets without affecting stage levels.

b. Record target data may be displayed in a summary view, a detailed table orientation or a spreadsheet view, which allows quick data comparisons, move and replace functions.

c. Changes to blind data shall be automatically stored. Range selection of both record targets and channels shall be supported.

3. Patch Display

a. Patch shall be used to display and modify the system control channels with their associated library data.

b. Each channel may be provided with a proportional patch level, curve, label, swap and invert functions, as well as keywords to service Query.

c. Offset functions in patch shall allow selection of channel ranges and shall allow the user to establish a "custom" footprint for any device output.

d. Custom color wheels, color scrolls and gobo wheels shall be defined in patch. These devices shall be created with a simple table and graphical user interface supported by images of major manufacturers.

e. RDM discovery and device monitoring shall be supported.

f. Copy to and Move functions shall be supported in patch.

4. Setup/Browser

a. Setup shall access system, user and device configurations.

b. It shall be possible to partially import Eos show files. Users shall be able to select as much or as little of the show file as required, with renumber tools.

c. It shall be possible to import ASCII and Lightwright data files. It shall be possible to export as ASCII or .csv.

d. Setup shall also access show data storage, import, export, print to .pdf and clear functions, as well as show data utilities.

e. The system shall support programming and playback of real time clock events, including cue, submaster and macro execution at specific times of specified days or at a time based on astronomical events.

f. A control screen shall be provided for network configuration, selecting date/time, software update controls, selecting functional language and/or keyboard for labeling option, as well as other system level tools.
g. Available languages for prompts, advisories and help messages shall include English, Bulgarian, German, Spanish, French, Italian, Japanese, Korean, Russian, Chinese, simplified and Chinese, traditional.
h. Supported keyboards shall include American, United Kingdom, French, German, Italian, Korean, Norwegian, Russian, Slovakian, Turkish, Swiss, Swedish, Finnish and Bulgarian.

E Dimmer Monitoring and Configuration

1. The lighting control system shall provide communication with an ETC Sensor+, Sensor3 or FDX dimming system for remote monitoring and configuration of show specific functions from within the software application.
2. Circuit level configuration and monitoring functions shall include but not be limited to:
   a. Control mode (dimmable, switched, latch-lock, always on, off or fluorescent).
   b. Curves
   c. Control threshold
   d. Min and Max Scale Voltage
   e. Preheat
   f. Scale load
3. Rack status messages shall include but not be limited to:
   a. State of UL924 panic closure
   b. DMX port error/failure
   c. Network error/failure
   d. A, B, C Phase below 90 or above 139 volts and headroom warning
   e. Ambient temperatures out of range
4. Circuit status shall include but not be limited to:
   a. Module type and location
   b. Output level
   c. Control Source
   d. Overtemp
5. Advanced circuit feedback shall include but not be limited to:
   a. Load higher or lower than recorded value
   b. DC detected on output
   c. SCR failed on/off
   d. Breaker trip
   e. Module has been removed
   f. Load failure
   g. Shutdown due to Overtemp

F Interface Options

1. The console shall support a variety of local interfaces.
   a. AC input
   b. USB (five ports for items such as alpha-numeric keyboard, mouse, touch screens, USB Flash drive)
   c. Ethernet (two ports)

d. Two Display Port output connectors, supporting Windows 7 compliant monitors as 1280x1024 resolution minimum. Touchscreen/multi-touch support of any/all of these monitors is provided.
e. Contact Closure trigger via D-Sub connector
f. 4 DMX/RDM ports
g. Alternative Contact Closure trigger through Gateway
h. OSC Transmit/Receive
i. MIDI In/Out, MSC and MIDI Notes through Gateway
j. SMPTE Timecode through Gateway

G Accessories
1. ETCPad (ETC Portable Access Device)
2. iRFR and iRFR Preview (applications for iPhone, iPod Touch and iPad units)
3. aRFR (application for Android devices)
4. Net3 Remote Video Interface
5. Gateways
a. Net3/ETCNet 2 to DMX/RDM Gateways (one to four ports)
b. MIDI/SMPTE Gateway
c. I/O Gateway with 12 analog inputs, 12 SPDT contact outputs, RS-232 interface

H Synchronized Backup
1. An optional Backup system shall consist of one of the following combinations of devices:
a. Two networked Consoles.
b. One Console with one Remote Processor Unit (RPU)
c. One (or more) Consoles with two Remote Processor Units (RPUs)
d. ETCnomad/Puck

I Physical
1. All operator controls and console electronics for a standard system shall be housed in a single desktop console, not to exceed 35" wide, 15" deep, 4.5" high, weighing 16 pounds. Console power shall be 90 – 240V AC at 50 or 60Hz, supplied via a detachable locking power cord.

J Approved Manufacturers and Products
1. Approved Manufacturers:
a. Electronic Theatre Controls
2. Supply the Following:

Qty	Model	Description
1	ELEMENT 2 1K	Element 2 Console 1,024 Output
1		22” Display
1	PCT2265	22” Touchscreen
1	ZDPCAT5ETEPJC25	25’ Ethercon to RJ45 cable
1	EWS360AP	Wireless Access Point
1	RWB	Littlelite Round Weighted Base
1	LW18HI	Littlelite 18in Desk Light with Dimmer

2.08 DATA PLUG-IN STATIONS

A General
1. The Plug-in Stations shall consist of the appropriate connectors required for the functional intent of the system. These stations shall be available with DMX input

or output, Remote Focus Unit, Network, or architectural control connectors. Custom control connectors shall be available.

B Connector Options

1. The following standard components shall be available for Plug-in Stations:
   a. 5-Pin male XLR connectors for DMX input
   b. 5-Pin female XLR connectors for DMX output
   c. 6-Pin female XLR connectors for RFU and ETCLink connections
   d. RJ45 connectors for Network connections - Twisted Pair
   e. 6-Pin female DIN connectors for Unison connections
   f. DB9 female serial connector for architectural control from a computer
2. Custom combinations and custom control connections shall be available.

C Physical

1. Station faceplates shall be .80" aluminum, finished in fine texture, scratch-resistant black powder coat.
2. The station panel shall mount into an industry standard back box, depending on size and quantity of connectors. A terminal block shall be supplied for contractor terminations.

D Approved Manufacturers and Products

1. Approved Manufacturers:
   a. Pathway
   b. Electronic Theatre Controls
2. Supply the Following:

Qty	Model	Description
2	ECPB DMXOUT / NET	DMX output with Network
1	ECPB NET	Ethercon Receptacle
1	ECPB NET/NET	(2) Ethercon Receptacles

2.09 POWER DISTRIBUTION – OUTLET AND PIGTAIL BOXES

A General

1. Connectors shall be available as 20A, 50A and 100A grounded stage pin, 20A twist lock and 20A "U" ground (dual rated "T-slot"); other connectors shall be available as specified
2. Pigtails shall be three-wire type "S" jacketed cable sized for the maximum circuit ampacity
3. Pigtails with 20 amp stage pin connectors shall be terminated using 12 gauge 4 way indent crimp (with inspection window) type where the wire is inserted and crimped directly in the socket
4. Terminations for pigtail connectors shall utilize feed- through terminals individually labeled with corresponding circuit numbers
   a. 20 amp circuits shall use screwless tension clamp terminals listed for 20 – 8 gauge wire
   b. 50 amp circuits shall use compression terminals listed for 10 – 1 gauge wire
   c. 100 amp circuits shall use compression terminals listed for 8 – 2/0 gauge wire
   d. Terminals that place a screw directly on the wire are not acceptable
5. Outlet and pigtail boxes shall be supplied with appropriate brackets and hardware for mounting as shown on the drawings
   a. Standard mounting options shall include pipe or wall mounting
   b. Brackets shall be made from ASTM A36 steel

c. Hardware shall be ASTM A307 grade 5

6. A low voltage distribution system shall be available to incorporate DMX, Ethernet or other protocols as specified in the power distribution box
   a. A voltage barrier shall be used to separate the low voltage wiring for the electrical circuits
7. Power distribution equipment shall be listed by a nationally recognized test lab (NRTL)

B Physical

1. Outlet and pigtail boxes shall be 6.25" H x 3.3" D and fabricated from 18 gauge galvanized steel and finished in black fine-texture powder coat paint
   a. Covers shall be fabricated from 16-gauge galvanized steel
2. Outlet and pigtail boxes shall be available in any length specified in increments of 3-inches with a maximum length of up to 3-feet
3. Pigtails and outlets shall be spaced on 18" centers or as otherwise specified
4. Outlets shall be mounted on individual 3" panels
5. Circuits shall be labeled with 1.25" lettering
   a. Circuit labeling options shall include:
      1) Circuits shall be labeled on the front side of the connector strip with white lettering on black background labels
      2) Circuits shall be labeled on front and back sides of the connector strip with white lettering on black background labels
      3) Circuits shall be labeled on the front side of the connector strip with engraved lamacoid labels utilizing white lettering on black background labels
      4) Circuits shall be labeled on the front and rear sides of the connector strip with engraved lamacoid labels utilizing white lettering on black background labels
      5) Circuits shall be labeled on one side of the connector strip using individual circuit cover plates with lettering engraved in the cover and filled with the specified color
      6) Circuits shall be labeled using specified labeling per plans and drawings
6. Outlet and pigtail boxes shall support optional LED indicators to indicate the presence of power at each local circuit. The indicator shall be red in color and mounted in outlet or pigtail box
   a. The LED indicator shall be mounted in the lower right corner of the outlet panel
   b. The LED indicator shall be mounted in the bottom of the outlet or pigtail box directly below the outlet panel
   c. The LED indicator shall be mounted in the cover plate directly below the circuit label for pigtail circuits

C Approved Manufacturers and Products

1. Approved Manufacturers:
   a. Altman
   b. Electronic Theatre Controls
   c. SSRC
2. Supply the Following:

Qty	Description
2	Pipe Mount Box with (2) Duplex Receptacles & DMX Output
1	Pipe Mount Box with (2) Duplex Receptacles

2.10 POWER DISTRIBUTION – CONNECTOR STRIPS

A General

1. Connectors shall be available as 20A, 50A and 100A grounded stage pin, 20A twist lock and 20A "U" ground (dual rated "T-slot"); other connectors shall be available as specified
2. Internal wiring shall be sized to circuit ampacity and shall be rated at 125°C
3. Pigtails shall be three-wire type "S" jacketed cable sized for the maximum circuit ampacity
4. Pigtails with 20 amp stage pin connectors shall be terminated using 12 gauge 4 way indent crimp (with inspection window) type where the wire is inserted and crimped directly in the socket
5. Terminations shall be at one end using feed-through terminals individually labeled with corresponding circuit numbers
    a. 20 amp circuits shall use screwless tension clamp terminals listed for 20 – 8 gauge wire
    b. 50 amp circuits shall use compression terminals listed for 10 – 1 gauge wire
    c. 100 amp circuits shall use compression terminals listed for 8 – 2/0 gauge wire
    d. Terminals that place a screw directly on the wire are not acceptable
6. Connector strips shall be supplied with appropriate brackets and hardware for mounting as shown on the drawings
    a. Connector strips shall have junction brackets on 5' centers
    b. Brackets shall be 1½" x .188" ASTM A36 steel
    c. Hardware shall be ASTM A307 grade 5
7. A low voltage distribution system shall be available to incorporate DMX, Ethernet or other protocols as specified in the connector strip. Connector strips shall utilize a voltage barrier to accommodate these systems. Low Voltage signals shall enter the connector strip via a strain relief or connector mounted in a separate low voltage terminal box at the specified end of the connector strip. Up to four low voltage cables shall be supported for each connector strip
    a. Connector strips with multiple DMX outputs from the same source shall use DMX pass through assemblies consisting of a 6" panel with the one DMX output connector, one DMX input (Pass Through) connector, one DMX pass through (Bypass) switch, and a label detailing the use of the pass through assembly
    b. The bypass switch shall be used when no DMX devices are present at that location. When activated, the DMX pass through switch shall pass DMX directly through to the next DMX panel on the strip. The pass through switch shall have a mechanical indicator to show the operator that it has or has not been engaged
8. Connector Strips shall be listed by a nationally recognized test lab (NRTL)

B Physical

1. Connector strips shall be 6.25" H x 3.3" D and fabricated from 18-gauge galvanized steel and finished in black fine-texture powder coat paint
    a. Covers shall be fabricated from 16-gauge galvanized steel
2. Connector strips shall be available in any length specified in increments of 6" and shipped fully wired with all splicing hardware
3. Pigtails and outlets shall be spaced on 18" centers or as otherwise specified
4. Outlets shall be mounted on individual 3" panels

5. No external terminal boxes shall be required for connector strips with 28 or fewer circuits unless otherwise specified
6. Circuits shall be labeled on the connector strip with 2" lettering
   a. Circuit labeling options shall include
      1) Circuits shall be labeled on the front side of the connector strip with white lettering on black background labels
      2) Circuits shall be labeled on front and back sides of the connector strip with white lettering on black background labels
      3) Circuits shall be labeled on the front side of the connector strip with engraved lamacoid labels utilizing white lettering on black background labels
      4) Circuits shall be labeled on the front and rear sides of the connector strip with engraved lamacoid labels utilizing white lettering on black background labels
      5) Circuits shall be labeled on one side of the connector strip using individual circuit cover plates with lettering engraved in the cover and filled with the specified color
      6) Circuits shall be labeled using specified labeling per plans and drawings
      7) Connector strips shall support optional LED indicators to indicate the presence of power at each local circuit. The indicator shall be red in color and mounted in the connector strip
         a) The LED indicator shall be mounted in the lower right corner of the outlet panel
         b) The LED indicator shall be mounted in the connector strip trough directly below the outlet panel
         c) The LED indicator shall be mounted in the center of the 3" plate directly below the circuit label for pigtail circuits

C Approved Manufacturers and Products

1. Approved Manufacturers:
   a. Altman Lighting
   b. Electronic Theatre Controls
   c. SSRC
2. Supply the Following:

Qty	Description
3	Connector Strip with (3) L5-20 Receptacles wired to 1 Circuit and (12) Duplex Receptacles wired to 4 Circuits

2.11 Color mixing or White-light Light Emitting Diode Profile fixture

A General

1. The fixture shall be a color-mixing high-intensity LED illuminator with DMX control of intensity and color. The fixture shall be a ColorSource Spot, ColorSource Spot Deep Blue or ColorSource Spot Pearl as manufactured by Electronic Theatre Controls, Inc. or approved equal.
2. All LED fixtures shall be provided by a single manufacturer to ensure compatibility
3. The fixture shall be UL 1573 listed for stage and studio use
4. The fixture shall comply with the USITT DMX512-A standard
5. The fixture shall be provided with the minimum warranty of 5 years full fixture coverage and 10 years LED array coverage
6. ColorSource Spot and ColorSource Spot Deep Blue

a. The fixture shall have a LM-84 report with a L70 rating of no less than 54,000 hours
   1) Substitutes must provide evidence of minimum L70 rating of no less than 54,000 hours
      a) If no LM-84 report is available, an acceptable alternate is a LM-80 report on all emitters with a LM-79 report and an in situ temperature measurement test verifying the conditions of the fixture meet the conditions of the LM-80 report
      b) All tests and reports must be completed by a Nationally Recognized Testing Laboratory
      c) All tests must be conducted to IES standards

7. ColorSource Spot Pearl
   a. The fixture shall have a LM-84 report with a L70 rating of no less than 36,000 hours
      1) Substitutes must provide evidence of minimum L70 rating of no less than 36,000 hours
         a) If no LM-84 report is available, an acceptable alternate is a LM-80 report on all emitters with a LM-79 report and an in situ temperature measurement test verifying the conditions of the fixture meet the conditions of the LM-80 report
         b) All tests and reports must be completed by a Nationally Recognized Testing Laboratory
   b. All tests must be conducted to IES standards

B Physical

1. The unit shall be constructed of rugged, die cast aluminum, free of burrs and pits
2. The following shall be provided:
   a. Lens secured with silicone shock mounts
   b. Shutter assembly shall allow for +/-25° rotation
   c. 20 gauge stainless steel shutters
   d. Interchangeable lens tubes for different field angles with Teflon guides for smooth tube movement
   e. Sturdy integral die cast gel frame holders with two accessory slots, and a top-mounted, quick release gel frame retainer
   f. Rugged steel yoke with two mounting positions allowing 300°+ rotation of the fixture within the yoke
   g. Positive locking, hand operated yoke clutch
   h. Slot with sliding cover for motorized pattern devices or optional iris
3. The housing shall have a rugged black powder coat finish
   a. White or silver/gray powder coat finishes shall be available as color options
   b. Other powder coat color options shall be available on request
4. Power supply, cooling and electronics shall be integral to each unit.
5. The unit shall ship with
   a. Theatrical-style hanging yoke as standard
   b. 5' cable with Neutrik powerCON™ to choice of connector as standard
   c. Gate diffuser
   d. A-size pattern holder
6. Available options shall include but not be limited to:
   a. Bare-end, Stage-Pin or Twist-lock type-equipped power leads

b. powerCON to powerCON cables for fixture power linking
c. Smooth Wash Diffuser for overlapping beams of light from multiple fixtures

C Optical
1. The light beam should have a 2-to-1 center-to-edge drop-off ratio
2. The unit shall provide, but not be limited to:
   a. Low gate and beam temperature
   b. Sharp imaging through a three-plane shutter design
3. The unit shall provide, but not be limited to:
   a. 5, 10, 14, 19, 26, 36, 50, 70 and 90 degree field angles
   b. High-quality pattern imaging
   c. Sharp shutter cuts without halation
   d. Shutter warping and burnout in normal use shall be unacceptable
   e. Adjustable hard and soft beam edges
4. 19, 26, 36, and 50 degree units shall have optional lens tubes available for precision, high-contrast imaging.
5. Shall work with S4 LED CYC and Fresnel adapters

D Environmental and Agency Compliance
1. The fixture shall be ETL and cETL LISTED and/or CE rated, and shall be so labeled when delivered to the job site.
2. The fixture shall be ETL LISTED to the UL1573 standard for stage and studio use
3. The fixture shall be rated for IP-20 dry location use.

E Thermal
1. Fixture shall be equipped with a cooling fan.
2. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 54,000 hours of use for color mixing versions and 36,000 hours for Pearl
   a. Thermal management shall include multiple temperature sensors within the housing to include:
      1) LED array circuit board temperatures
      2) Fixture ambient internal temperature
3. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 40° C (104°F) maximum ambient temperature.

F Electrical
1. The fixture shall be equipped with a 100V to 240V 50/60Hz internal power supply
2. The fixture shall support power in and thru operation
   a. Power in shall be via Neutrik® powerCON™ input connector
   b. Power thru shall be via Neutrik ® powerCON™ output connector
   c. Fixture power wiring and accessory power cables shall be rated to support linking of multiple fixtures up to the capacity of a 15A breaker
3. The fixture requires power from a non-dim source
4. Fixtures shall have droop compensation to prevent thermal shift of color or intensity
5. Power supply outputs shall have self-resetting current-limiting protection
6. Power supply shall have power factor correction

G LED Emitters
1. The fixture shall contain a minimum of four different LED colors to provide color characteristics or two color temperature white LEDs for the Pearl products, as described in the Color Section below

2. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.
    a. Fixture shall utilize Luxeon® Rebel™ LED emitters
3. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.
4. LED emitters should be rated for nominal 54,000-hour L70 rating for color mixing versions and 36,000-hour L70 rating for Pearl variant
5. LED system shall comply with all relevant patents

H Calibration

1. Fixture shall be calibrated at factory for achieve consistent color and intensity output between fixtures built at different times and/or from different LED lots or bins
    a. Calibration data shall be stored on the control card as a permanent part of on-board operating system
    b. All arrays, including replacement arrays shall be calibrated to the same standard to insure consistency
    c. Fixtures not offering LED calibration shall not be acceptable

I Color

1. The fixture shall utilize an minimum of 60 LED emitters
    a. These emitters shall be made up of Red, Green, Blue and Lime for ColorSource
    b. These emitters shall be made up of Red, Green, Indigo and Lime for ColorSource Deep Blue
    c. These emitters shall be made up of 2700 K and 6500 K for ColorSource Pearl

J Dimming

1. The LED system shall use 15-bit nonlinear scaling techniques for high-resolution dimming.
2. The fixture shall utilize an Incandescent dimming curve
3. Dimming curve shall be optimized for smooth dimming over longer timed fades.
4. The LED system shall be digitally driven using high-speed pulse width modulation (PWM)
5. LED control shall be compatible with broadcast equipment in the following ways:
    a. PWM control of LED levels shall be imperceptible to video cameras and related equipment
    b. PWM shall be capable of being set via RDM to 25,000hz

K Control and User interface

1. The fixture shall be USITT DMX512-A compatible via In and Thru 5-pin XLR connectors or RJ45 connectors
2. The fixture shall be compatible with the ANSI RDM E1.20 standard
    a. All fixture functions shall accessible via RDM protocol for modification from suitably equipped control console
    b. Temperature sensors within the luminaire shall be viewable in real time via RDM
    c. Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible
3. The fixture shall be equipped with a 7-segment display
4. The fixture shall be equipped with a three-button user-interface
5. A variable-rate strobe channel shall be provided

6. The fixture shall offer stand-alone functionality eliminating the need for a console
   a. Fixture shall ship with 12 preset colors or color temperatures accessible as a stand-alone feature
   b. Fixture shall ship with 5 sequences accessible as a stand-alone feature
   c. Each color and sequence can be modified by the end user via RDM
   d. Fixtures can be linked together with standard DMX cables and controlled from designated master fixture
   e. Up to 32 fixtures may be linked
   f. Fixtures in a stand-alone state shall restore to the settings present prior to power cycling, eliminating the need for reprogramming
   g. Fixtures without stand-alone operation features described above shall not be acceptable

L Approved Manufacturers and Products

1. Approved Manufacturers:
   a. Altman Lighting
   b. Electronic Theatre Controls
2. Each fixture to include safety, c-clamp, appropriate power cable, and appropriate DMX cable.
3. Supply the Following:

Qty	Model	Description
27	CSSPOTS	Colorsource Spot
27	4##LT	##° Lens Tube- Beam spread to be determined by integrator based on lighting position and plot

2.12 ELLIPSOIDAL SPOTLIGHT

A General

1. The instrument shall be a Source Four jr ellipsoidal spotlight as manufactured by Electronic Theatre Controls, Inc., or approved equal.

B Auxiliary Electronic Silent Dimmer

1. General
   a. The dimmer shall be the Source Four Dimmer Model ES750 as manufactured by Electronic Theatre Controls, Inc., or equal. Dimmer shall be a silent voltage reducing portable yoke mount dimmer which mounts directly to ETC Source Four luminaires.
   b. The dimmer shall regulate incoming power to maximum 115V output. Dimmers that cannot provide regulated maximum output of 115V shall not be acceptable.
   c. Acoustic specification replaces rise time specification. The combination of luminaire and dimmer shall not exceed 0dBA (0-20,000 Hz) acoustic noise at 0-100% dimmable range when measured from a distance of 1 meter and no more than 12dBA when measured at 6 inches. Dimmers that produce measurable noise above 0dbA at 1 meter distance shall not be acceptable. Lamp silencing effects of dimmers that use phase control as a means of silencing lamps are either load dependent or thermally dependent. Phase control dimmers shall not be acceptable.
   d. The dimmer shall support up to 750W 115V lamps.
   e. The dimmer shall be CE compliant, UL listed, and shall be so labeled
2. Mechanical
   a. The dimmer shall be a self-contained unit, suitable for portable use. It shall be constructed of aircraft quality powder coated aluminum. Minimum thickness of heat sink to be 2.5mm and 2mm for aluminum enclosure.

b. The dimmer shall be convection cooled and shall operate without cooling fans or filters.
c. The dimmer shall have integrated bracket mounting hardware for versatility of yoke mounting to maintain vertical position of cooling fins and choice of connector orientation when mounting the fixture in under mount, over mount, or yoked out positions. Dimmers that cannot be cooled properly in yoked out position shall not be acceptable.
d. The dimmer shall be 187mm in length, 165mm high and 91mm wide and weigh no more than 4lbs.

3. Electrical
   a. The dimmer shall be powered by a single phase PNE, 20A power cable feed.
   b. The dimmer shall shut itself down electronically to prevent overload.
   c. The dimmer shall use electronic silent dimming technique which results in rectified AC amplitude control to regulate voltage. Dimmers that use phase angle dimming generate undue noise and shall not be acceptable.
   d. Lamp output shall not change more than 1V per 10V of change of input voltage.
   e. Dimmer shall be capable of being powered from the output of another dimmer, phase angle or other, set to full. This shall not affect the performance of the Source Four Dimmer.
4. Control
   a. The dimmer shall contain DMX512A Input and Through XLR5 connectors. The design shall allow up to 31 dimmers on one DMX line along with a DMX controller.
   b. The dimmer shall support ANSI E1.20 Remote Device Management (RDM) for:
      1) Curve modification
         a) Modified Square law (default)
         b) Linear (control-vs.-voltage)
         c) Preheat (using modified square law)
      2) Error Notifications
         a) Over temp
         b) No load
         c) Overload
      3) Sensors
         a) Input voltage
         b) Input frequency
         c) Internal dimmer temperature
      4) Read/change DMX address
      5) Set local control level/clear local control
      6) Trigger software upgrade
   c. Dimmer control electronics shall include the following indicators and controls:
      1) One status LED indicator: Power and Valid DMX
      2) 3 x 8 segment display
      3) 3 buttons including test for locally setting of level, up, and down

C Physical

1. The unit shall be constructed of rugged, die cast aluminum, free of burrs and pits, finished in black, high temperature epoxy paint. Instruments using a combination of sheet metal and die cast structural components shall not be acceptable.
2. The following shall be provided:
    a. Integral cable clamp for power leads
    b. Positive locking of lamp focus and independent lamp alignment controls
    c. High impact, thermally insulated knobs and shutter handles
    d. Reflector secured with shock mounts
    e. Lens secured with shock mounts
    f. 20 gauge stainless steel shutters
    g. Sturdy integral die cast gel frame holders with two accessory slots, and a top mounted, quick release gel frame retainer
    h. Rugged steel yoke with two mounting positions allowing 300°+ rotation of the fixture within the yoke
    i. Positive locking, hand operated yoke clutch
    j. Slot with sliding cover for motorized pattern devices or optional iris

D Optical

1. The optical train shall combine a compact filament lamp with a precision molded borosilicate, ellipsoidal reflector and aspheric lens to produce an optimum cosine field.
2. The unit shall provide, but not be limited to:
    a. Molded borosilicate reflector with multiple dichroic layers
    b. 95% of visible light shall be reflected while 90% of infrared light as heat shall be transmitted through the reflector
    c. Low gate and beam temperature
    d. Sharp imaging through a bi-plane shutter design
    e. Projector-quality, high contrast aspheric lenses

E Performance

1. The unit shall be precision engineered to use an HPL lamp to deliver an even, intense field with cosine distribution.
2. The unit shall provide, but not be limited to:
    a. 26, 36, and 50 degree field angles
    b. 25 - 50 degree Zoom range
    c. High quality pattern imaging
    d. Sharp, high-contrast shutter cuts
    e. Shutter warping and burnout in normal use shall be unacceptable
    f. Adjustable hard and soft beam edges
3. The unit shall be capable of utilizing ETC Dimmer Doubling technology.
4. The unit shall be UL and cUL listed and so labeled.

F Lamp

1. The high efficiency lamp shall be an HPL lamp, which shall consist of a compact tungsten filament contained in a krypton-filled quartz envelope. The lamp shall mount axially within the reflector. The lamp base shall have an integral die cast aluminum heat sink that reduces seal temperature and ensure proper lamp alignment. The lamp socket shall be ATP 220 nickel gold plated.

G Approved Manufacturers and Products

1. Approved Manufacturers:
    a. Electronic Theatre Controls

2. Each fixture to include safety, c-clamp, appropriate power cable, and appropriate DMX cable.
3. Supply the Following:

Qty	Model	Description
12	HPL 575 Long Life	HPL 575W Long Life Lamp (new)
6	426J-C	Source Four Jr 26° Fixture- Black (from Waynesville HS)
6	436J-C	Source Four Jr 36° Fixture- Black (from Waynesville HS)
12	ES750-C	ES750, UL w/ Twist Lock Connectors- Black (new)
12	400PH-M	M Size Pattern Holders

2.13 COLOR MIXING LED ZOOM WASH FIXTURE

A General

1. The fixture shall be Red, Green, Blue, and White LED luminaire with motorized zoom and DMX control. The fixture shall be the AP-150 RGBW by Altman Stage Lighting, Inc. or approved equal.
2. The fixture shall incorporate a state of the art microprocessor-controlled solid state LED light engine, and on-board power supply
3. The fixture shall utilize active cooling and feature advanced cooling mitigation and control from either the DMX controller or via an active cooling system on board settings.
4. The fixture shall utilize a high efficiency optics and zoom mechanism to achieve greater than 1,900 lumens of output with a 12°- 65° beam angle motorized zoom.
5. IES photometric files, at multiple beam angles shall be available upon request from the manufacturer to model light output using the industry standard design software.
6. The fixture shall comply with USITT DMX-512 A, ANSI E1.20-2006, and ANSI E1.37-2 (2015) Remote Device Management over USITT DMX 512A Standard (RDM) for DMX controlled models. Luminaires not utilizing E1.37.2 (2015) RDM standard shall not be acceptable.
7. The fixture shall be ETL Listed to UL1573, and UL8750 LED for stage and studio use as well as Portable Electric Luminaires (UL Standard 153) and CE marked.
8. Fixtures which do not comply with this specification shall not be accepted.

B Physical

1. The fixture shall be constructed in majority of an aluminum die cast shell. Construction shall employ all corrosion-resistant materials and hardware and shall be free of pits and burrs.
2. Standard finish shall be epoxy black, electrostatic application. The fixture shall be available with a black color finish.
3. Power supply, cooling and electronics shall be integral to each unit.
4. Fixture dimensions shall be 10.2” (259mm) L x 13.62” (346mm) H x 9.06” 230m) Dia. and weigh 11lbs (5.08 kg) without accessories.
5. The fixture shall include a blending optic to reduce the projection of multiple shadows from the different color sources in the fixture.
6. Fixture shall be equipped with a dual slot accessory holder with tool-free quick release accessory holder clips with self-locking accessory retaining latch.
7. An integrated rigid flat steel kick stand yoke with locking tilt handle shall be available for stand-alone floor and overhead pipe mounting.
    a. Pipe mounted fixtures shall be supplied as an additional accessory, a cast iron C-clamp Altman #510 suitable for use on up to 2” nominal (50.8 mm) O.D. pipe. Clamp must incorporate a 360-degree rotational “safety stud”

with locking bolt. Any clamp not offering this safety feature will not be acceptable.

b. Fixtures shall be supplied, as an additional accessory, with safety cable for use when securing the fixture to a pipe.

C Thermal

1. The fixture shall be cooled via an active cooling system and shall be capable of Progressive Output Management (POM): where the fixtures' logic follows a set of rules based upon the operators operational preferences. This logics shall include:
   a. Direct DMX control: the fixture's DMX channel will control the fan's output, in conjunction with the Progressive Output Management when the luminaire is on. This control will enable the end user to silence the fan when low intensity is required.
   b. Static (fixed) fan settings: When the unit is set to a defined "fixed" fan speed - if the LED reaches a maximum threshold temperature, the output of the luminaire will be reduced until thermal equilibrium is reached.
   c. Automatic fan settings: when the unit is set to automatic fan control, fan cooling will slowly increase and decrease based upon the operating temperature.
2. Under normal operating conditions, the LED engine shall be capable of 50,000 hours rated lifespan to LM-70 / 70% maximum calibrated intensity with Progressive Output Management cooling, units not utilizing this style of cooling management shall not be accepted.
3. Ambient operating temperature shall be 32°F to 104°F (0 – 40 °C) non-condensing and IP-20 rated for indoor dry location use.

D Electrical

1. The fixture shall be equipped with 100V to 240V 50/60 Hz auto-ranging internal power supply and requires power from a constant "non-dim" power source for.
2. The fixture shall receive power via a PowerCon™ blue power inlet and thru power via a PowerCon™ grey power outlet.

E Control and User Interface

1. A local control keypad with a graphical user LCD display shall be provided for configuration, control, and review of:
   a. DMX-512A Device Address
   b. Status
   c. Manual settings
   d. Zoom Control
   e. Fan Control
   f. General Settings
2. It shall be possible to lock out the control keypad at the fixture to prevent accidental change in fixture configuration during operation. Locking and unlocking the control keypad shall be via predefined keypad lock.
3. Each fixture shall be compatible with the USITT DMX512-A control protocol, ANSI E1.20-2006 and ANSI E1.37-2 (2015) Remote Device Management over DMX512-A (RDM) standards.
4. The DMX-512A device address for each fixture shall be user selectable.
5. It shall be possible to set the DMX-512A device address for the fixture both locally and while the fixture is installed and connected to the system via the RDM (ANSI E1.20-2006 protocol) and an appropriate device such as a PC, lighting console, or a handheld programmer.

6. Fixtures which do not allow for setting of the DMX address via both local controls at the fixture and remotely while installed via RDM shall not be accepted.
7. The fixture shall have an available “Master Channel” function to provide control of intensity without changing the color of the output of the fixture. The master shall operate in either 8-bit or 16-bit resolution as defined by the configuration of the fixture.
8. The fixture shall have user selected personalities to correctly match response to the application and control system utilized. Personalities shall provide the following options which may be combined as desired:
    a. RGB, HSIC, 8 or 16 Bit DMX operation
    b. On board preset color operation
    c. Strobe (up to 30 hz)
    d. Stand-alone effects
    e. Stand-alone fixed output
9. The fixture shall be capable of standalone operation, activated and configured at the control keypad. Standalone modes shall include the following:
    a. Fixed color temperature defined with local control presets or DMX control.
    b. Strobe with user selectable color and speed – up to 30 HZ.

F Optical

1. A 4:1 matrix of LEDs shall provide color or tunable white light or fixed white light, via an RGBW emitter. Fixtures not utilizing built in white points or color presets shall not be accepted.
2. All lenses to feature cosine beam and field distribution and feature a 4:1 beam to field distribution ratio.
3. The fixture shall feature a motorized zoom from spot (12°) to flood (65°) via DMX or manual settings with five (5) different nominal bean angle stop points of:
    a. VNSP (Very Narrow Spot)
    b. NSP (Narrow Spot)
    c. MFL (Medium Flood)
    d. WFL (Wide Flood)
    e. XWFL (Extra Wide Flood)
    f. Fixtures not utilizing a motorized zoom with both manual and Dmx control shall not be accepted.
4. The fixture’s optics shall be designed so as not to produce color shadows when used with beam shaping accessories such as barn doors or top-hats.
5. The fixture shall have an available dimming curve settings mode which makes PWM control of LED levels imperceptible to video cameras and related broadcast equipment.
6. A custom color control algorithm shall control the calibration of the colors from luminaire to luminaire. Color calibration shall be able to be turned on or off via the menu system or RDM. Fixtures not employing advanced color control calibration shall not be accepted.

G Light Emitting Diodes

1. The fixture shall use a specific 4:1 LEDs for a wide range of color mixing or tuning for color models the standard configuration shall be Red, Green, Blue, and White LEDs with a white point of 6,500° Kelvin.
2. The fixtures led’s shall be discretely binned in concert with the color calibration system to ensure color consistency from fixture to fixture.

H Dimming Engine

1. The fixture shall provide full range dimming performance based upon its DMX input control signal and configuration and shall be equipped with an LED system compatible with standard 8-bit and 16-bit input, with high resolution dimming.
2. Dimming curves shall be optimized for smooth dimming at low intensities and over longer timed fades. Dimming curve settings to include:
   a. Standard
   b. Incandescent
   c. Linear
3. LEDs shall be driven by Pulse Width Modulation. (PWM)
4. Additional smoothing algorithms shall be available to augment the high resolution dimming engine.

I Approved Manufacturers and Products

1. Approved Manufacturers:
   a. Altman Lighting
   b. Electronic Theatre Controls
2. Each fixture to include safety, c-clamp, appropriate power cable, and appropriate DMX cable.
3. Supply the Following:

Qty	Model	Description
21	AP-150	LED RGBW Zoom Par

2.14 COLOR MIXING LED WASH FIXTURE

A General

1. The fixture shall be Red, Green, Blue, Amber, White, and UV LED luminaire with DMX control. The fixture shall be the SixPar 100 by Elation.
2. The fixture shall incorporate a state of the art microprocessor-controlled solid state LED light engine, and on-board power supply

B Physical

1. The fixture shall be constructed in majority of an aluminum die cast shell. Construction shall employ all corrosion-resistant materials and hardware and shall be free of pits and burrs.
2. Standard finish shall be epoxy black, electrostatic application. The fixture shall be available with a black color finish.
3. Power supply, cooling and electronics shall be integral to each unit.
4. Fixture dimensions shall be 10.1” (257mm) L x 9.6” (243mm) H x 4.9” (125mm) W and weigh 7.4lbs (3.3 kg) without accessories.

C Thermal

1. Under normal operating conditions, the LED engine shall be capable of 100,000 hours rated lifespan to LM-70 / 70% maximum calibrated intensity.
2. Ambient operating temperature shall be 5°F to 113°F (-15 – 45 °C) non-condensing and IP-20 rated for indoor dry location use.

D Electrical

1. The fixture shall be equipped with 110V to 250V 50/60 Hz auto-ranging internal power supply and requires power from a constant “non-dim” power source for.
2. The fixture shall receive power via a PowerCon™ blue power inlet and thru power via a PowerCon™ grey power outlet.

E Control and User Interface

1. A local control keypad with a graphical user LCD display shall be provided for configuration, control, and addressing.

2. Each fixture shall be compatible with the USITT DMX512-A control protocol, ANSI E1.20-2006 and ANSI E1.37-2 (2015) Remote Device Management over DMX512-A (RDM) standards.
3. The DMX-512A device address for each fixture shall be user selectable.
4. It shall be possible to set the DMX-512A device address for the fixture both locally and while the fixture is installed and connected to the system via the RDM (ANSI E1.20-2006 protocol) and an appropriate device such as a PC, lighting console, or a handheld programmer.
5. Fixtures which do not allow for setting of the DMX address via both local controls at the fixture and remotely while installed via RDM shall not be accepted.
6. The fixture shall be capable of standalone operation, activated and configured at the control keypad. Standalone modes shall include the following:
   a. Fixed color temperature defined with local control presets or DMX control.
   b. Strobe with user selectable color and speed – up to 30 HZ.

F Optical
1. Static 15° Beam Angle

G Approved Manufacturers and Products
1. Approved Manufacturers:
   a. Elation
2. Each fixture to include safety, c-clamp, appropriate power cable, and appropriate DMX cable.
3. Supply the Following:

Qty	Model	Description
21	SIXPAR100	Six PAR 100 (from Waynesville HS)

2.15 LED FOLLOW SPOT

A General - Luminaire
1. The luminaire shall be a 11000K fixed white LED - 490 watt Follow spot luminaire capable of producing over 10,000 lumens. The luminaire shall be the AFS-500 LED Follow Spot from Altman Lighting Inc. or approved equal.
2. The luminaire shall incorporate a microprocessor-controlled solid-state LED light engine, and on-board power supply.
3. The luminaire shall incorporate quiet active cooling no greater than 34 dBA at .5m to maintain luminous intensity.
4. The luminaire shall utilize high efficiency and patented optics to render a homogenized shade of white at the focal plane.
5. Photometric files shall be available upon request from the manufacturer.
6. The luminaire shall comply with USITT DMX-512 A.
7. Luminaire shall be rated ETL or equally accredited 3rd party compliance certification and be CE listed.
8. The luminaire shall be UL1573 and UL8750 LED listed for stage and studio use.
9. The luminaire shall ship with:
   a. AFS-500 Control Module - Integrated
   b. Adjustable and collapsible black Tripod
   c. 5’ Neutrik PowerCon™ to Edison power cable as standard.
   d. AFS-500 Manual
   e. AFS-500 LED Follow spot containing:
      1) Internal Five (5) facet automated Dichroic color wheel
      2) Internal three (3) facet automated Dichroic CTO Wheel
      3) Internal eighteen (18) Leaf automated iris

4) Internal 7°-13° Manual Zoom Lens
5) Internal Manual Focus Lens

f. Luminaires that do not provide the above feature sets as a standard option shall not be considered.

10. Available connector options shall include but not be limited to:
    a. Raw cable-end, 20A Stage-Pin, 20A Twist-lock, or 16A CEE type equipped power leads.
11. Luminaire shall be rated IP20
12. Warranty to include a minimum of 3 years on all components of the luminaire.

B General – Control Panel

1. The luminaire control panel shall be located on the rear housing of the luminaire. The control panel will be rendered inactive when under DMX control. Luminaires not employing local and DMX control shall not be accepted.
2. The control panel will employ back lit indicator lights for each color and led on/off status.
3. The controller shall have control of:
    a. LED on/off
    b. Dimmer – Slider for controlling output intensity
    c. Strobe – Slider for controlling strobe rate.
    d. CTO - Slider for controlling Color Temperature.
    e. Iris – Slider for opening and closing luminaires iris.
    f. Color (6) Six Back lit buttons

C Physical

1. The luminaire shall be constructed of extruded aluminum, refined and without burrs, pits, or rough edges. Plastic and steel components shall be used within the luminaire.
2. Luminaire shall weigh no more than 25.5 pounds (11.5kg).
3. Luminaire shall feature an integrated rear handle.
4. The luminaire shall contain a specialized LED array light engine, optimized specifically for this luminaire's optical system.
5. Overall dimensions of the luminaire shall not be larger than the following dimensions:
    a. 11.75" (298.5mm) tall (inc. yoke)
    b. 10.38" (263.7 mm) wide
    c. 30.5" (774.7 mm) long
6. All major parts and components shall be black. Luminaire body shall be anodized, not painted.
7. An additional accessory holder for standard 7.5" x 7.5" shall be completely boxed in on three (3) sides, guarding filter frames from damage. Filter frame shall be capable of supporting industry standard 7.5" x 7.5" accessories.
8. All system components (including electronics, power supply, and cooling shall be integral to each unit. Units utilizing external power supplies, ballasts, or transformers shall not be accepted.

D Electrical

1. The luminaire shall be equipped with 100V to 240V 50/60 Hz universal power supply.
2. Luminaire shall feature up to a 490 watt long-life LED emitter matrix. Luminaire shall not consume more than 500W in normal operation.
3. Power input shall be via Neutrik Powercon.

4. Automatic power correction power supply shall be standard.
5. Quiescent power load shall be no more than 47 watts.
6. PWM frequency shall be variable, based upon dimming timing - with an upper limit of 15 kHz.

E Thermal

1. Under normal operating conditions, the LED engine shall be capable of 50,000 hours rated lifespan to LM-70 / 70% maximum calibrated intensity with active cooling.
2. Ambient operating temperature 32°F to 104°F (0 – 40 °C).
3. Active cooler shall consist of a pulse width modulation-controlled fan.
4. Fan shall automatically adjust for lowest possible noise output for a given luminance output.
5. Luminaire shall employ temperature sensors on all temperature sensitive equipment to ensure to ensure stated LM rating.

F Control and User Interface

1. The luminaire shall provide full range (0-100%) dimming without exhibiting flicker or stepping to both the eye and HD camera. Dimming curves shall be optimized for smooth dimming at low intensities and over longer timed fades.
2. A local control keypad with LCD display shall be provided for configuration and control of:
   a. DMX-512A Device Address
   b. Luminaire Personality
   c. Stand Alone Operation
3. Each luminaire shall be compatible with the USITT DMX512-A control protocols.
4. DMX or Local Control shall be connected via integral flush mount 5-Pin XLR input and output connectors.
5. Luminaire shall include integral flush mount 5-pin XLR output connector for DMX pass through or “Daisy Chain”. Luminaires not including an output receptacle for DMX pass through shall not be acceptable.
6. The DMX-512A device address for each luminaire shall be user selectable.
7. The luminaire shall be capable of standalone operation, activated and configured at the control keypad. Standalone functions shall include the following:
   a. Fixed Color defined with local controls
   b. Strobe
   c. CTO
   d. Iris
   e. Dimmer
   f. Led on/off
   g. Slave

G Optical

1. Luminaire shall feature a custom matrix of LEDs to provide fixed color temperature white light. Variations of LED matrices to produce a 11000K native white beam with color and CCT variations via integrated color and CTO wheels.
2. Luminaire shall feature a fully homogenized output at the focal plane to enable color temperature changes without visible colors at the lens.
3. Lenses to feature cosine beam and field distribution and feature a 2:1 beam to field distribution ratio.
4. Zoom range shall be manually controlled and shall provide a range no less than 7 – 13 degrees in beam angle.

5. Focus Lens system shall be manually controlled and shall provide a crisp concise beam with a sharp edge and allow for a soft edged beam with out affecting the previously set zoom.
6. An Automated 18 facet iris shall be capable of shaping the beam edge to reduce the over all beam diameter allowing for a 2.5 degree beam when fully closed.
7. An Automated CTO wheel capable of thee (3) different CTO settings shall be integral to the AFS-500 and shall be able to achieve 7400K, 6000K, and 4200K color temperatures. Luminaires with out CTO capability shall not be accepted.
8. A five (5) position color wheel capable of adding color to the beam in conjunction with the CTO wheel shall be capable of full or split colors.
9. A LED ON/OFF button (DMX Channel) shall allow for instant ON/OFF of the LED array following the luminaires initial calibration start up.
10. A variable strobe function up to 20hz (20 times a second) shall be available standard on the luminaire. Any luminaire not offering strobe functionality shall not be accepted.
11. A range of accessories shall be available from the manufacturer including but not limited to:
    a. Cylindrical Hood (top hat)
    b. Front Accessory Holder 7.5” x 7.5”
    c. Color frame
    d. Accessory Color Boomerang (6 Color)
    e. Weighted handle
    f. Follow spot Handle
    g. Extended Zoom / Focus Handles

H Light Emitting Diodes

1. The luminaire shall utilize a proprietary mix of white LEDs to produce the output as specified.
2. LEDs shall be from reputable manufacturers with a proven track record for quality.
3. All LEDs shall be subject to rigorous single binning and mixing procedures.
4. LEDs shall be calibrated to an absolute nm wavelength CIE1931 X & Y coordinates.
5. Burn-in procedure to be no less than 8 hours.

I Dimming Engine

1. LEDs shall be driven by Pulse Width Modulation. (PWM)
2. PWM rates shall be variable and above 9800hz, ensuring no camera phasing, image flip or roll.
3. Dimming curves shall be smooth with no perceptible steps over long fades. Follow spots utilizing flag or chop mechanical dimmers shall not be accepted.
4. Luminous Output: Shall meet or exceed 10000 lumens output at narrow beam and produce no less than 95fc (1025 LUX) at 100’-0” (30.48M)

J Approved Manufacturers and Products

1. Approved Manufacturers:
    a. Altman Lighting
    b. Canto
    c. Lycian
2. Followspot to include tripod stand and appropriate power cable.
3. Supply the Following:

Qty	Model	Description

2	AFS-500-B	490W LED Followspot 100-240VAC- Black
2	AFS-ACCFF	Followspot Accessory Frame
2	AFS-ECB	Followspot Accessory External Color Boomerang

2.16 White Light Emitting Diode Floodlight

A General

1. The fixture shall be a 3,500K yoke mount floodlight. The fixture shall be a Kreios FLx as manufactured by Osram or approved equal.

B Physical

1. The fixture shall be contained in a rugged all-metal die-cast housing, free of burrs and pits
2. The housing shall have a rugged black finish
3. Power supply and electronics shall be integral to each unit.
4. The unit shall ship with
   a. Theatrical-style hanging yoke as standard

C ENVIRONMENTAL AND AGENCY COMPLIANCE

1. The fixture shall be ETL Listed.
2. The fixture shall be rated for IP-65 outdoor use.

D THERMAL

1. The fixture shall be natural convection cooled and shall not use a fan
2. The fixture shall operate in 40° C (104°F) maximum ambient temperature.

E ELECTRICAL

1. The fixture shall be equipped with 120V 60 Hz internal power supply
2. The fixture can dim with a leading edge or trailing edge dimmer.

F LED Emitters

1. The fixture shall contain 3,500K white LED emitters.
2. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.
3. LED emitters should be rated for nominal 40,000 hour LED life to 70% intensity

G Warranty

1. The fixture shall be provided with the minimum warranty:
   a. 3 years full fixture coverage

H Approved Manufacturers and Products

1. Approved Manufacturers:
   a. SSRC
   b. Altman Lighting
   c. Osram
2. Each fixture to include safety, and c-clamp.
3. Supply the Following:

Qty	Model	Description
6	FLx	LED 3,000K floodlight with L5-20 plug

2.17 C-Clamps

A All C-clamps shall be permanently marked with a load rating. Cast C-clamps are not acceptable.

B Approved Manufacturers

1. The Light Source
2. Apollo Design

2.18 DMX Cables

A Theatrical Integrator responsible for appropriate length
B 5 Pin XLR Connectors
C Heavy-duty cable construction intended for use as a portable data cable in a stage environment
D Approved Manufacturers
1. LEX
2. TMB
3. Blizzard
4. Chauvet

Part 3. Execution

3.01 Installation of Theatrical Lighting System

A It shall be the responsibility of the Electrical Contractor to receive and store the necessary materials and equipment for installation of the dimmer system. It is the intent of these specifications and plans to include everything required for proper and complete installation and operation of the dimming system, even though every item may not be specifically mentioned. The contractor shall deliver on a timely basis to other trades any equipment that must be installed during construction.
B The electrical contractor shall be responsible for field measurements and coordinating physical size of all equipment with the architectural requirements of the spaces into which they are to be installed.
C The electrical contractor shall install all lighting control and dimming equipment in accordance with manufacturers approved shop drawings.
D All branch load circuits shall be live tested before connecting the loads to the dimmer system load terminals.

3.02 SYSTEM COMMISSIONING AND TRAINING

A General
1. Prior to operational checkout, the Electrical Contractor shall confirm the following conditions.
a. All control stations are installed and terminated per the vendor's integration drawings.
b. Availability of owner's staff for instruction
c. Space is clear of workmen and may be blacked out for extended periods
d. Building and equipment feeders are energized
e. HVAC systems are operational in Control Booths and Dimmer Equipment Spaces
f. Stage luminaries are installed and connected to the dimming system to confirm that individual dimmed circuits are in operational order
g. Dimmer rack and all equipment is cleaned and ready for operational check-out.
2. Notify vendor in writing, at least 21 days prior to requested startup date, that the system is ready for startup.
3. Costs of additional or repeat visits due to delay, lateness, or negligence on the part of the Electrical Contractor shall be borne by the Electrical Contractor.
B Low Voltage Cable Terminations
1. Systems Integrator shall provide a factory certified technician to provide final termination of low voltage control wiring at Signal Processing Rack, DMX Receptacles, Architectural Control Stations, and Distribution Boxes.
C Fixture Hang and Focus

1. Systems Integrator shall unbox, assemble, address, hang and focus all theatrical lighting fixtures to a plot created by the integrator per the plans. To include dressing of cable using standard braided tie line.

D Testing

1. The vendor's Field Service Representative shall complete the following:
   a. Inspect the Electrical Contractor's installation for conformance to vendor's instructions.
   b. Confirm all wiring runs and termination and make notes as required.
   c. Make notes and diagrams as needed for completion of As-Built Documents as specified elsewhere in this section. Make note of any deviations from vendor's directions
   d. Measure incoming voltages at the relay rack and record
   e. Configure relay rack, console, stations and other components for proper operation.
   f. Test each wired space of relay rack for proper operation
   g. Test all control stations, consoles and auxiliary controls for proper operation.
   h. Replace any equipment not operating as specified.

E Training

1. A factory certified representative of the vendor shall instruct the Owner's staff or representatives in the operation and maintenance of the system. This instruction session shall be scheduled to last a minimum of eight (8) hours. These training session shall be broken into two (2) individual training sessions. While it may be possible to schedule this instruction session to coincide with the system checkout, such coincidence shall not be assumed.

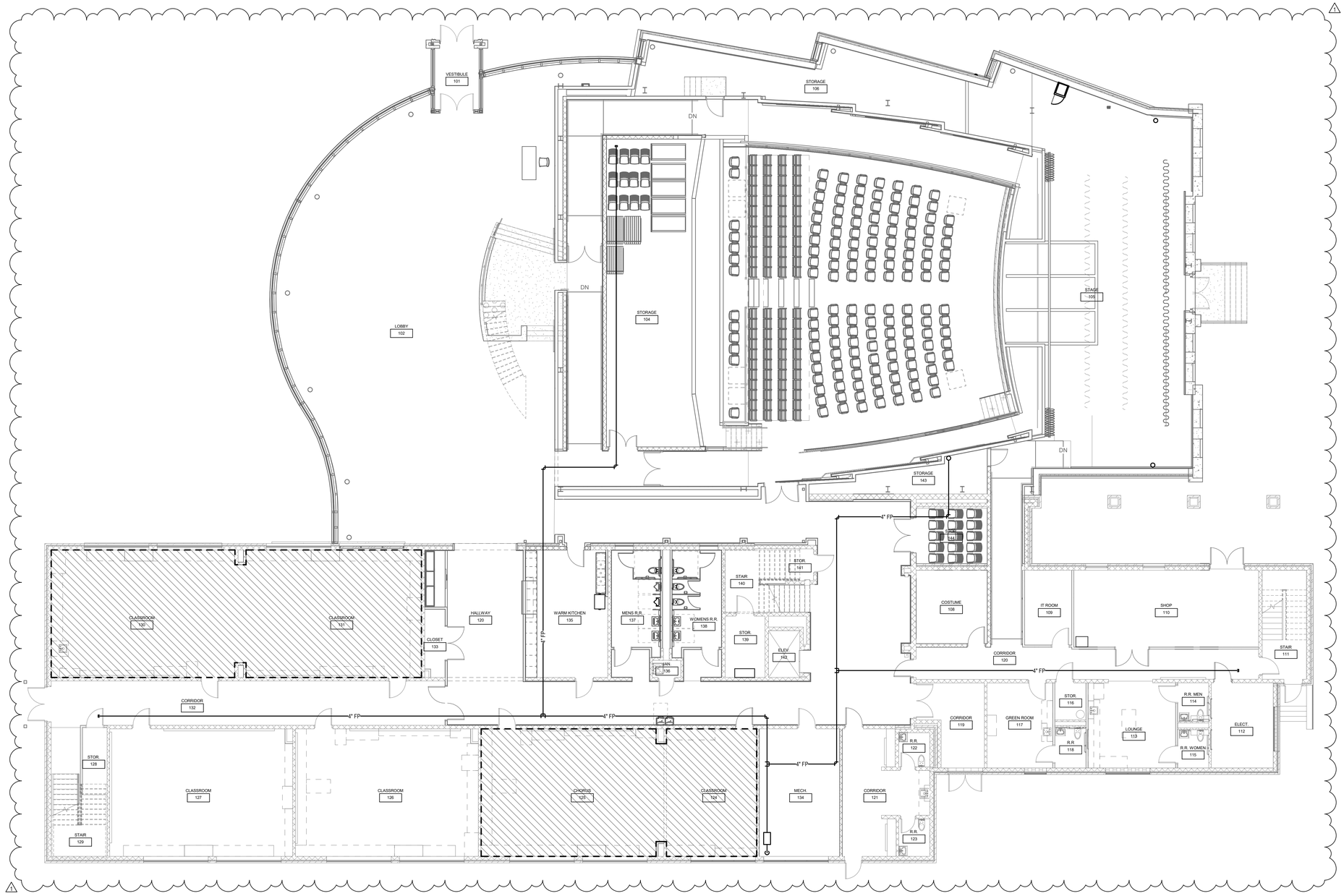
END OF SECTION 265561

3/12/2021 1:50:22 PM

C:\Users\jwaldron\Documents\OWPA20_MEP_R20_jwaldronUC2020.rvt

FP HATCH LEGEND

- LIGHT HAZARD AREA CLASSIFICATION
- ORDINARY HAZARD, GROUP 1 CLASSIFICATION
- ORDINARY HAZARD, GROUP 2 CLASSIFICATION



1 FIRST FLOOR FIRE PROTECTION PLAN ALTERNATE
SCALE: 1/8" = 1'-0"

SHEET NOTES:

TAGGED NOTES #

No.	Revisions / Submissions	Date
1	ADDENDUM 1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

FIRE SUPPRESSION FIRST FLOOR PLAN ALTERNATE

CMTA
222 E. 14th Street. Floor 4. Cincinnati, Ohio 45202
513 429 4404 f 513 429 4693 www.cmta.com

STATE OF OHIO
BRADLEY STEVEN BRUENING
81283
REGISTERED PROFESSIONAL ENGINEER

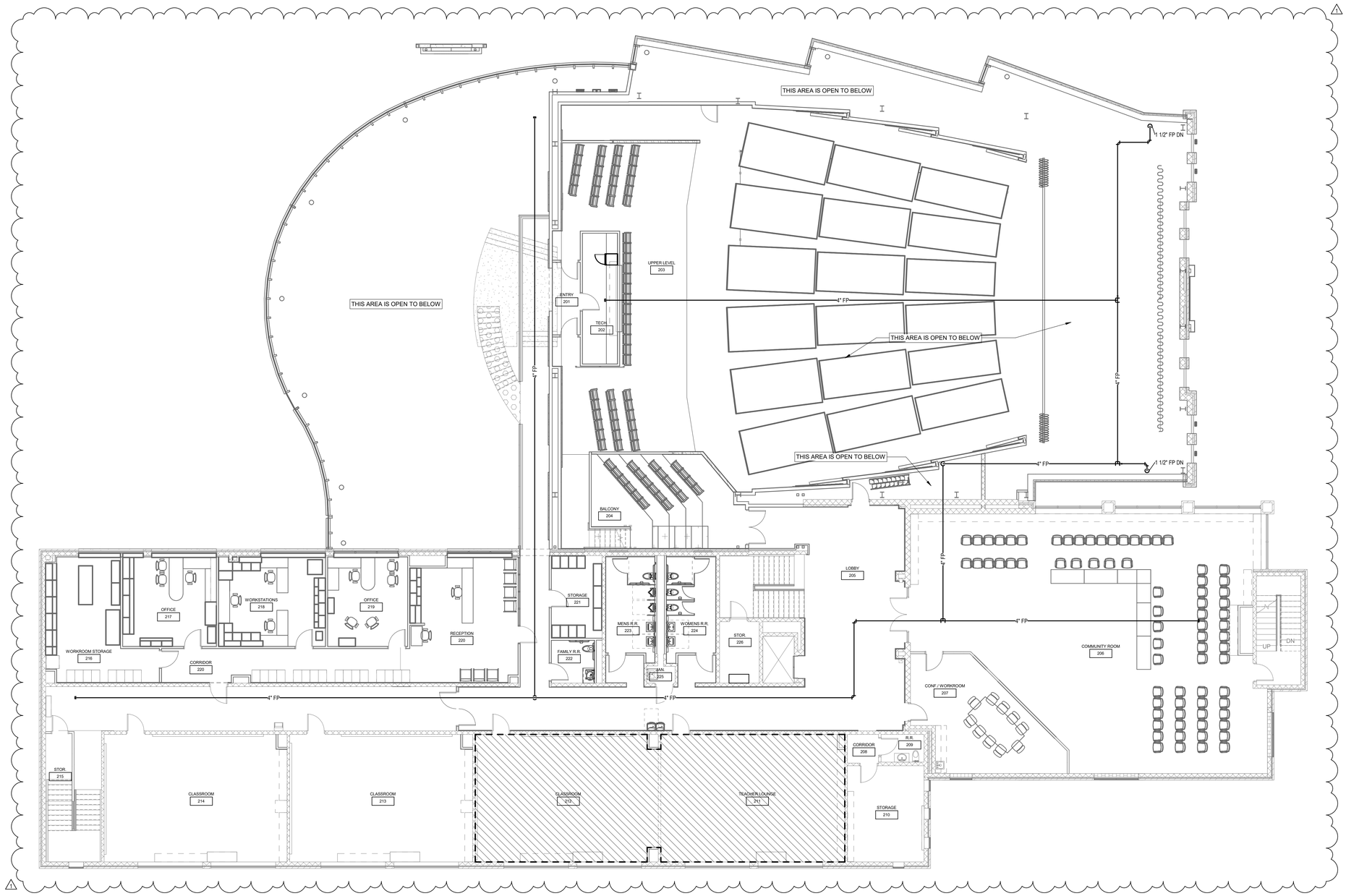
Comm. No.	Date
18620.00	2021/03/01
Drawn: JDW	Drawing No.: F102
Checked: BSB	

3/12/2021 1:50:28 PM

C:\Users\jwaldron\Documents\OWPA20_MEP_R20_jwaldronUC2020.rvt

FP HATCH LEGEND

- LIGHT HAZARD AREA CLASSIFICATION
- ORDINARY HAZARD, GROUP 1 CLASSIFICATION
- ORDINARY HAZARD, GROUP 2 CLASSIFICATION



1 SECOND FLOOR FIRE PROTECTION PLAN ALTERNATE
SCALE: 1/8" = 1'-0"

SHEET NOTES:

TAGGED NOTES #

No.	Revisions / Submissions	Date
1	ADDENDUM 1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

FIRE SUPPRESSION SECOND FLOOR PLAN ALTERNATE

CMTA
222 E. 14th Street. Floor 4. Cincinnati, Ohio 45202
513 429 4404 f 513 429 4693 www.cmta.com

STATE OF OHIO
BRADLEY STEVEN BUESKING
81283
REGISTERED PROFESSIONAL ENGINEER

Comm. No.	Date
18620.00	2021/03/01
Drawn: JDW	Drawing No.: F104
Checked: BSB	

ROOF MECHANICAL DEMOLITION PLAN
SCALE: 1/8" = 1'-0"

SHEET NOTES:

TAGGED NOTES

MD14	REMOVE EXISTING EXHAUST FAN, CURB, AND ASSOCIATED ELECTRICAL. ROOF OPENING SHALL BE REPAIRED SO AS TO NOT VOID ANY EXISTING ROOF WARRANTY.
MD16	EXISTING PACKAGED ROOFTOP TO REMAIN.

No.	Revisions / Submissions	Date
1	ADDENDUM 1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

MECHANICAL ROOF DEMOLITION

CMTA
222 E. 14th Street. Floor 4. Cincinnati, Ohio 45202
513 429 4404 f 513 429 4693 www.cmta.com

STATE OF OHIO
BRIAN K. ROSE
E-56929
REGISTERED
PROFESSIONAL ENGINEER

Comm. No.	Date
18620.00	2021/03/01
Drawn: KAS	Drawing No.: M103
Checked: BKR	

3/15/2021 2:13:56 PM

GENERAL COMMENTS FOR CONTROL SYSTEM

1. TIME SCHEDULES (ALL TIMES SHALL BE USER ADJUSTABLE):
   a. When the system is fully tested and operational and after the Owner's staff have been fully instructed as to the operation of the system the schedule shall be as follows unless otherwise instructed:
   b. All initial time schedules shall be coordinated with the owner before programing is done.
   c. Each piece of equipment shall have its own adjustable time schedule.
   d. All schedules shall be coordinated and confirmed with the Owner prior to final implementation.
2. BUILDING PRESSURE SENSORS:
   a. The TCC will install (2) building pressure sensors. One will be installed in the event space and the other in the lobby space. Wire back to the BAS for monitoring.

RTU-1,2 CONTROL SEQUENCE

1. GENERAL: The RTU shall be provided with factory controls. The TCC shall provide and install combined thermostat/ humidity sensors, CO2 sensors and a wet bulb sensor installed in the joist space by the TCC and wired to the BAS. See plans for sensor locations. The BAS will provide an output to the RTU controller.
2. This unit has the following components:
   A. Exhaust and Outside Air Dampers (Economizer Mode)
   B. Power Exhaust Fan (Building Relief), ECM
   C. Filters
   D. RTU-1: (1) Variable Speed Compressor, (2) Fixed Speed Compressors
   E. RTU-2: (1) Variable Speed Compressor
   F. Supply Fan, ECM
   G. Gas Heat
   H. Humidity Control
   I. Hot gas reheat coil
   J. Needlepoint ionization
3. The rooftop unit shall be placed into operation by the DDC system based upon user defined schedule. The factory controller will change from cooling, fan only or heating based on the heating and cooling setpoints.
4. SUPPLY AIR FAN: The supply fan shall modulate from its minimum to maximum speed as required to maintain space temperature.
5. POWER EXHAUST AIR FAN: The Exhaust fan will be controlled by damper tracking exhaust air damper to the outside air damper. The difference in air flow to be 300 CFM (RTU-1) and 100 CFM (RTU-2).
6. OUTSIDE AIR DAMPER CONTROL: An airflow measuring station (integral to the unit) is to be provided on the outside air intake. The damper is to modulate based on the air flow station to maintain the minimum and maximum outside air requirements during normal occupied operation regardless of supply fan speed. The minimum outside air is to be 550 CFM (RTU-1) and 260 CFM (RTU-2). The maximum outside air is to be 2,000 CFM (RTU-1) and 400 CFM (RTU-2).
7. HEATING MODE: When the zone is calling for heating. The supply fan and gas heat shall modulate to maintain space temperature. The maximum discharge air temperature shall be 95°F.
8. COOLING MODE: The economizer dampers and compressors shall modulate to maintain supply air temperature setpoint at 55°F (adj.). Once the unit reaches its minimum airflow the discharge air temperature will reset up to meet space set point. Minimum supply air flow to be 3,500 CFM (RTU-1) and 1,800 CFM (RTU-2).
9. ECONOMIZER MODE: Economizer shall be comparative enthalpy control with modulating power exhaust. Minimum outside airflow shall be 2,000 CFM (RTU-1) and 400 CFM (RTU-2).
10. DEHUMIDIFICATION MODE: When the space temperature is at set point but the space humidity is above 55% (Adj.), the compressors will turn on and modulate up to 100% and the hot gas reheat will run to keep a leaving unit temperature suitable to maintain the space temperature and humidity set point. The unit will continue to dehumidify until the space is down to 50% humidity. The TCC shall generate an alarm if the space humidity remains 10% above setpoint for more than 30 min.
11. OUTSIDE AIR RESET: The outside air will reset based on space CO2. If the space CO2 is 400 PPM and the building is occupied, the outside air damper will reset to the minimum outdoor air CFM as stated in the equipment schedule. If the CO2 in the space reaches 1000 PPM it will modulate to maintain 1000 PPM but will not exceed the maximum outside air amount called out in the equipment schedule.
12. UNOCCUPIED SUPPLY AIR TEMPERATURE HEATING: If the space has a call for heating, the air handling unit shall start and supply 85°F air to the space. The minimum outside air damper position will be 0%.
13. UNOCCUPIED SUPPLY AIR TEMPERATURE COOLING: If there is a call for cooling in the space the air handling unit shall run in occupied mode except the minimum outside air damper position shall be 0% open.
14. UNOCCUPIED DEHUMIDIFICATION MODE: If the space is at temperature but the humidity exceeds 55% (Adj.), the compressors will turn on and modulate up to 100% and the hot gas reheat will run to keep a leaving unit temperature suitable to maintain the space temperature at set point. The unit will continue to dehumidify until the space is down to 50% humidity.
15. BUILDING WARM UP: The unit shall use optimal start to warm the space to set point. Warm up sequence shall start 1 hour (Adj.) prior to the building entering occupied mode. Maximum supply air temperature shall be 95°F. Outside air to remain off.
16. BUILDING COOL DOWN: The unit shall use optimal start to cool space to set point. Cool down sequence shall start 1 hour (Adj.) prior to the building entering occupied mode. The outside air damper is to remain closed during this sequence. During building cool down the leaving air temperature from the unit must be higher than the building wet bulb. The leaving air temperature off the unit to be controlled by hot gas reheat. Wet bulb sensor to be located in joist space of the auditorium and the lobby.
17. BUILDING SMOKE EMERGENCY: The RTU is to be shut down during a building smoke emergency. Signal for shut off to be provided by fire alarm system.
18. NEEDLEPOINT IONIZATION: The needlepoint ionization will run whenever the supply fan is running. TCC to wire the output alarm to the BAS and provide an alarm if the unit does not run when called to do so.
19. The BAS shall monitor BACnet Points specified and provide all equipment schedules and setpoints.
20. SAFETIES:
    A. Turn off the supply and exhaust fan if the return air smoke detector indicates that smoke is present.
    B. Turn off the supply and exhaust fan if the duct static pressure exceeds 3.0" w.g.
21. MONITORS AND ALARMS:
    A. Provide alarm for smoke.
    B. Monitor the differential pressure across the filters and provide a notification when the filters need to be replaced.
    C. Monitor the status of the supply and exhaust fan with a current switch. Provide an alarm when the fans are commanded on but a fan is not running.
22. Setpoints (adj.):
    A. Occupied cooling: 74 °F (adj.) +/- 2 °F warmer/ cooler adjust (adj.)
    B. Unoccupied cooling: 80 °F (adj.)
    C. Occupied heating: 70°F(adj.) +/-2°F warmer/ cooler adjust (adj.)
    D. Unoccupied heating: 60 °F (adj.)

RTU-1,2, TCC POINTS LIST

POINTS LIST	ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	TREND	ALARM
Space Temperature (Qty)	X				X	High temperature > 85F Low Temperature< 55F
Space humidity (Qty)	X				X	High humidity > 70%
Space Temperature to the RTU		X			X	
Space Humidity to the RTU		X			X	

RTU-1,2, POINTS LIST

BACNET OBJECTS TO THE BAS POINTS LIST	ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	TREND	ALARM
OCCUPIED / UNOCCUPIED			X	X		STATUS DOES NOT MATCH COMMAND
UNIT STATUS			X		X	
MORNING WARM-UP STATUS			X		X	
COOLING STATUS / CAPACITY	X		X		X	
GAS HEATING STATUS / CAPACITY	X		X		X	
SUPPLY FAN STATUS / SPEED	X		X			
EXHAUST FAN STATUS / SPEED	X		X			
ECONOMIZER STATUS	X					
DISCHARGE AIR TEMPERATURE	X				X	HIGH TEMP LOW TEM
DISCHARGE AIR TEMPERATURE SETPOINT		X				
RETURN AIR TEMPERATURE	X					
OUTDOOR AIR TEMP	X					
OUTSIDE AIR CFM	X					AIRFLOW MEASURING STATION
OUTSIDE AIR CFM SETPOINT		X				
ENTERING FAN / LEAVING COIL TEMP	X					
MIXED AIR TEMPERATURE	X					
BUILDING STATIC PRESSURE	X					
DEW POINT TEMPERATURE	X					
HOT GAS REHEAT		X				
OCCUPIED COOLING TEMP SETPOINT		X				
OCCUPIED HEATING TEMP SETPOINT		X				
UNOCCUPIED COOLING TEMP SETPT		X				
UNOCCUPIED HEATING TEMP SETPT		X				
DUCT STATIC PRESSURE SENSOR	X					
SPACE TEMPERATURE / HUMIDITY	X					
WET BULB SENSOR	X					
RETURN AIR SMOKE DETECTOR			X			ALARM
NEEDLEPOINT IONIZATION		X				ALARM
DIRTY FILTER SWITCH			X			ALARM
DUCT HIGH LIMIT SWITCH			X			ALARM
DUCT LOW LIMIT SWITCH			X			ALARM

DOAS-1 CONTROL SEQUENCE

1. GENERAL: The RTU shall be provided with factory controls with BACnet communication protocol for integration into the BAS.
2. This unit has the following components:
   A. Supply Fan, VFD
   B. Exhaust Fan, ECM
   C. Outside Air, Exhaust Air Dampers
   D. Filters
   E. Energy Recovery Wheel, VFD
   F. (1) Inverter Scroll Compressor
   G. Gas Heat
   H. Hot gas reheat coil
3. The rooftop unit shall be placed into operation by the DDC system based upon user defined schedule. The factory controller will change from cooling, fan only or heating based on the heating and cooling setpoints.
4. UNOCCUPIED MODE: The unit shall be off when scheduled as unoccupied and during building cool-down or warm-up. The outside air and exhaust air dampers shall be closed.
5. OCCUPIED MODE: The unit shall operate under factory sequences and shall include control of the unit for discharge air temperature, humidity and discharge air reset.
6. SUPPLY AIR FAN: The supply fan shall operate at constant volume to maintain the outside air CFM as stated in the schedule. An airflow measuring station shall be provided on the outside air intake.
7. EXHAUST AIR FAN: The Exhaust fan shall operate at constant volume to maintain the exhaust air CFM as stated in the schedule.
8. HEATING MODE: When there is a call for heating to maintain the discharge air temperature setpoint, the energy recovery wheel shall operate to precondition the air, and the gas heat shall modulate to maintain the discharge air temperature setpoint. The unit shall operate to maintain a discharge air temperature setpoint between 68 °F (adj.) and 74 °F (adj.).
9. COOLING MODE: When there is a call for cooling to maintain the discharge air temperature setpoint, the energy recovery wheel shall operate to precondition the air, and the compressor shall modulate to maintain the discharge air temperature setpoint. The unit shall operate to maintain a discharge air temperature setpoint between 65 °F (adj.) and 74 °F (adj.).
10. DEHUMIDIFICATION MODE: A return air humidity sensor shall be placed in the main return duct prior to entering the unit. The unit shall be placed into dehumidification mode when the return air relative humidity is above 60% (adj.). The energy recovery wheel shall operate to precondition the air, and the compressor shall modulate to maintain a leaving coil temperature of 55 °F. The hot gas reheat shall modulate to maintain the discharge air temperature setpoint.
11. BUILDING SMOKE EMERGENCY: The RTU is to be shut down during a building smoke emergency. Signal for shut off to be provided by fire alarm system.
12. The BAS shall monitor BACnet Points specified and provide all equipment schedules and setpoints.
13. SAFETIES:
    A. Turn off the supply and exhaust fan if the return air smoke detector indicates that smoke is present.
    B. Turn off the supply and exhaust fan if the duct static pressure exceeds 3.0" w.g.
14. MONITORS AND ALARMS:
    A. Provide alarm for smoke.
    B. Monitor the differential pressure across the filters and provide a notification when the filters need to be replaced.
    C. Monitor the status of the supply fan, exhaust fan and energy recovery wheel with a current switch. Provide an alarm when commanded on but not running.

DOAS-1, POINTS LIST

BACNET OBJECTS TO THE BAS POINTS LIST	ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	TREND	ALARM
OCCUPIED / UNOCCUPIED			X	X		STATUS DOES NOT MATCH COMMAND
UNIT STATUS			X		X	
COOLING STATUS / CAPACITY	X		X		X	
GAS HEATING STATUS / CAPACITY	X		X		X	
SUPPLY FAN STATUS / SPEED	X		X			
EXHAUST FAN STATUS / SPEED	X		X			
DISCHARGE AIR TEMPERATURE	X				X	HIGH TEMP LOW TEM
DISCHARGE AIR TEMPERATURE SETPOINT		X				
RETURN AIR TEMPERATURE	X					
RETURN AIR HUMIDITY	X					
SUPPLY LEAVING WHEEL TEMPERATURE	X					
EXHAUST LEAVING WHEEL TEMPERATURE	X					
OUTDOOR AIR TEMP	X					
OUTSIDE AIR CFM	X					AIRFLOW MEASURING STATION
OUTSIDE AIR CFM SETPOINT		X				
SUPPLY AIR ENTERING FAN / LEAVING COIL TEMP	X					
OUTSIDE AIR DAMPER			X	X		STATUS DOES NOT MATCH COMMAND
EXHAUST AIR DAMPER			X	X		STATUS DOES NOT MATCH COMMAND
BUILDING STATIC PRESSURE	X					
ENERGY RECOVERY WHEEL STATUS			X			ALARM
HOT GAS REHEAT		X				
OCCUPIED COOLING TEMP SETPOINT		X				
OCCUPIED HEATING TEMP SETPOINT		X				
RETURN AIR SMOKE DETECTOR			X			ALARM
OUTSIDE AIR DIRTY FILTER SWITCH			X			ALARM
RETURN AIR DIRTY FILTER SWITCH			X			ALARM
DUCT HIGH LIMIT SWITCH			X			ALARM
DUCT LOW LIMIT SWITCH			X			ALARM

(E) RTU, TCC POINTS LIST

BACNET OBJECTS TO THE BAS POINTS LIST	ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	TREND	ALARM
OCCUPIED / UNOCCUPIED			X	X		STATUS DOES NOT MATCH COMMAND
UNIT STATUS			X		X	
MORNING WARM-UP STATUS			X		X	
COOLING STATUS / CAPACITY	X		X		X	
SUPPLY FAN STATUS / SPEED	X		X			
ECONOMIZER STATUS	X					
DISCHARGE AIR TEMPERATURE	X				X	HIGH TEMP LOW TEM
DISCHARGE AIR TEMPERATURE SETPOINT		X				
RETURN AIR TEMPERATURE	X					
OUTDOOR AIR TEMP	X					
ENTERING FAN / LEAVING COIL TEMP	X					
MIXED AIR TEMPERATURE	X					
DUCT STATIC PRESSURE SENSOR	X					
RETURN AIR SMOKE DETECTOR			X			ALARM
DIRTY FILTER SWITCH			X			ALARM
DUCT HIGH LIMIT SWITCH			X			ALARM
DUCT LOW LIMIT SWITCH			X			ALARM

TCC SHALL INTEGRATE EXISTING PACKAGED RTU INTO NEW BUILDING AUTOMATION SYSTEM. CONTRACTOR TO VERIFY INTEGRATION IS POSSIBLE WITH EXISTING UNIT CONTROLS OR PROVIDE NEW IF REQUIRED.

SPLIT SYSTEMS:

1. TCC to provide a thermostat in the spaces that have a split system to monitor temperature. Provide an alarm if the temperature exceeds 80°F.

POINTS LIST	ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	TREND	ALARM
ROOM TEMPERATURE	X				X	ALARM IF 80°F IS EXCEED.

VARIABLE/CONSTANT AIR VOLUME (VAV) TERMINAL UNIT

1. The terminal unit shall have a pressure independent control system.
2. A wall mounted thermostat/temperature sensor shall control the VAV box, unless noted otherwise.
3. When building is occupied and no heating or cooling is required, the VAV box airflow shall be at minimum for code required ventilation to the space.
4. When building is unoccupied and no heating or cooling is required, the VAV box airflow shall be at 0 CFM.
5. When cooling is required, the variable air inlet damper shall modulate between the minimum and maximum airflow rates to maintain room air temperature setpoint.
6. When heating is required, the variable air inlet damper shall be in the minimum air flow rate position and the electric heating coil modulated to maintain room setpoint. If additional heating is required, airflow shall be modulated to maximum airflow setpoint.
7. Primary Air CFM shall be monitored by BAS. An air flow sensor shall be located on the inlet side of the VAV box. This shall be used to set minimum/maximum setpoints.
8. Provide setpoint limit adjustment on each VAV graphics page.

Setpoints (adj.):

Occupied cooling: 74 °F +/- 2 °F warmer/ cooler adjust
Unoccupied cooling: 80 °F
Occupied heating: 70 °F +/- 2 °f warmer/ cooler
Unoccupied heating: 65 °F

POINTS LIST	ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	TREND	ALARM
SPACE TEMPERATURE	X				X	HIGH ALARM LOW ALARM
DISCHARGE AIR TEMPERATURE	X					
AIRFLOW	X					
DAMPER		X				
ELECTRIC HEATING COIL		X				

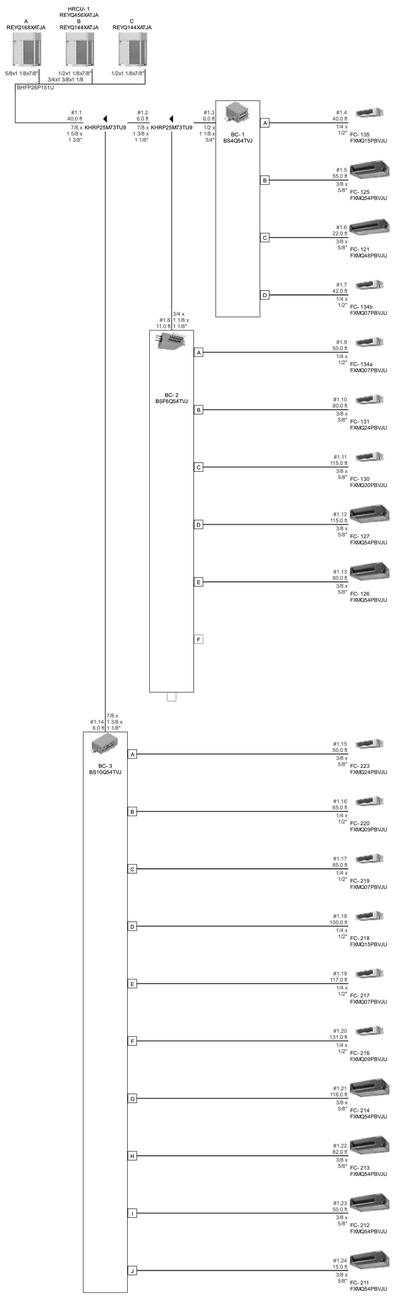
EXHAUST FANS:

1. EF-1 & 2
   A. Fan shall operate continuously regardless of building occupancy.
2. Existing EF
   A. Fan shall operate continuously during building occupied hours.

POINTS LIST	ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	TREND	ALARM
FAN STATUS			X	X		STATUS DOES NOT MATCH COMMAND

Piping HRCU- 1

ALL PIPING LENGTHS AND SIZES NEED TO BE VERIFIED BY THE CONTRACTOR AND MANUFACTURER. LENGTHS LISTED BELOW ARE NOT MEANT AS A TAKE OFF.



1 VRV PIPING SCHEMATIC
SCALE: 12" = 1'-0"

No.	Revisions / Submissions	Date
1	ADDENDUM 1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

WAYNE LOCAL SCHOOLS

WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

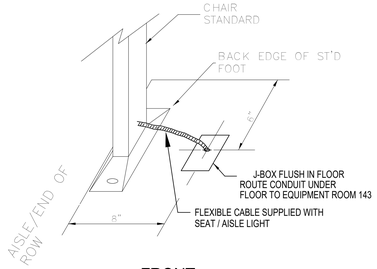
MECHANICAL CONTROLS

CMTA
222 E. 14th Street. Floor 4. Cincinnati, Ohio 45202
513 429 4404 f 513 429 4693 www.cmta.com

STATE OF OHIO — BRIAN K. ROSE E-56929 — REGISTERED PROFESSIONAL ENGINEER

Comm. No.	Date
18620.00	2021/03/01
Drawn: KAS	Drawing No.: M501
Checked: BKR	

C:\Users\ksmith\Documents\OWPA20_MEP_R20_ksmith2B8OX3.rvt



3 AISLE LIGHT - TYPE "TD"
SCALE: 1" = 1'-0"

OCCUPANCY CONTROLS

OS A - OCCUPANCY SENSOR (A) CORRIDOR

A. BUSINESS HOURS LIGHTS ARE ON.
B. AFTER HOURS LIGHTING AUTO ON TO 100% WHEN OCCUPANCY DETECTED.
C. LIGHTING AUTO OFF WITHIN 20 MINUTES OF OCCUPANTS LEAVING.
D. NORMAL POWER FAILURE EMERGENCY LIGHTING SHALL REVERT TO 100% ON.

OS B - OCCUPANCY SENSOR (B) RESTROOM

A. FOR EACH RESTROOM, LIGHTING AUTO ON TO 100% AND EXHAUST FAN (IF APPLICABLE) TO AUTO ON WHEN OCCUPANCY IS DETECTED.
B. LIGHTING AND EXHAUST FAN (IF APPLICABLE) TO AUTO OFF FOR EACH RESTROOM WITHIN 10 MINUTES OF OCCUPANTS LEAVING.
C. NORMAL POWER FAILURE EMERGENCY LIGHTING SHALL REVERT TO 100% ON.

OS C - OCCUPANCY SENSOR (C)

A. LIGHTING AUTO ON TO 100% WHEN OCCUPANCY IS DETECTED.
B. LIGHTING TO AUTO 50% OFF WITHIN 20 MINUTES OF OCCUPANTS LEAVING.
C. REMAINING 50% WILL REMAIN ON CONTINUOUSLY TO PROVIDE FAILSAFE EMERGENCY OR NORAML EGRESS.

OS - OCCUPANCY SENSOR - MEDIUM STORAGE, CLOSETS

A. LIGHTING AUTO ON TO 100% WHEN OCCUPANCY DETECTED.
B. LIGHTING AUTO OFF WITHIN 20 MINUTES OF OCCUPANTS LEAVING.

$OS - OCCUPANCY SENSOR SWITCH

A. LIGHTING AUTO ON TO 100% WHEN OCCUPANCY DETECTED.
B. LIGHTING AUTO OFF WITHIN 20 MINUTES OF OCCUPANTS LEAVING.

VACANCY CONTROLS

VS - VACANCY SENSOR

A. LIGHTING MANUAL ON VIA LOCAL SWITCH.
B. PROVIDE MANUAL CONTROL OF DIMMING FOR LIGHTING VIA MASTER RAISE/LOWER WITH DIMMER SWITCH.
C. LIGHTING AUTO OFF WITHIN 20 MINUTES OF OCCUPANTS LEAVING.
D. NORMAL POWER FAILURE EMERGENCY LIGHTING SHALL REVERT TO 100% ON.

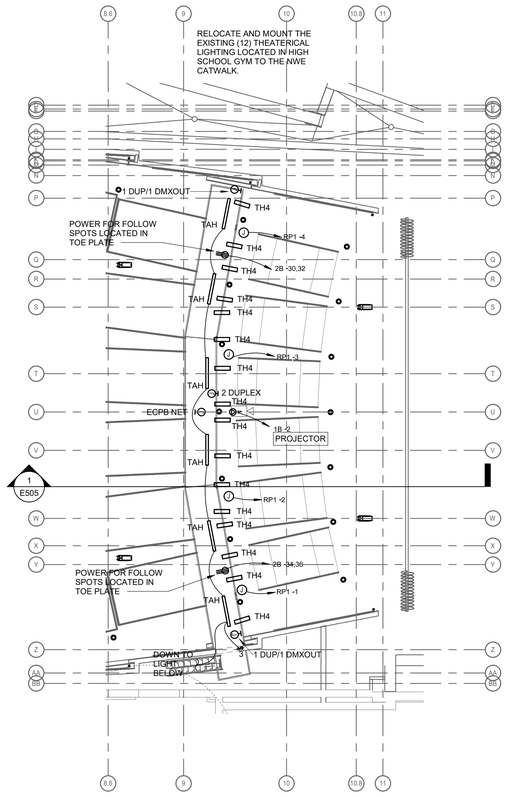
$VS - VACANCY SWITCH

A. PROVIDE MANUAL CONTROL OF DIMMING FOR LIGHTING VIA MASTER RAISE/LOWER WITH DIMMER SWITCH.
B. LIGHTING AUTO OFF WITHIN 20 MINUTES OF OCCUPANTS LEAVING.

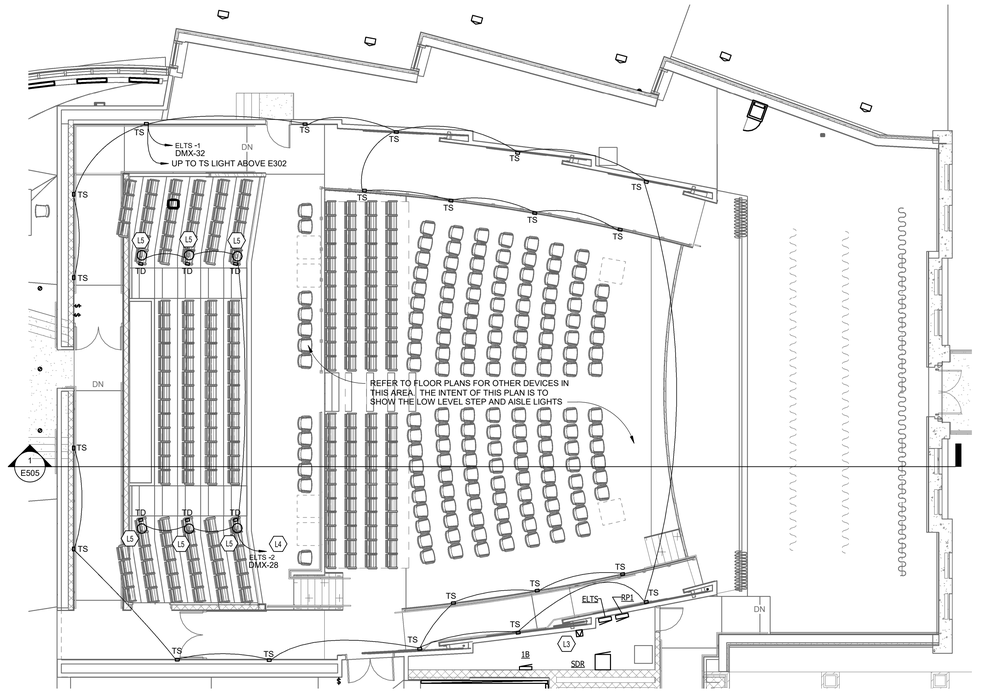
SCENE CONTROLS

$LV1 - 4 SCENE, ON/OFF, RAISE/LOWER

A. GENERAL LIGHTING IS TO BE MANUAL ON. PROGRAM SYSTEM TO MAINTAIN AN AVERAGE OF 50FC MAX IN SPACE.
B. MANUAL CONTROL OF DIMMING FOR LIGHTING ZONES VIA RAISE/LOWER FUNCTION ON CONTROL STATION.
C. CONTROL STATION TO ALSO HAVE (4) PROGRAMMABLE PRESET SCENES. INITIAL PROGRAMMING SHALL BE:
   a. 15%
   b. 40%
   c. 75%
   d. 100%
D. FOR CLASSROOMS WITH PHOTOCELLS, LIGHTING WILL CONTINUOUSLY DIM BASED ON DAYLIGHTING CONTRIBUTION TO MAINTAIN THE MAXIMUM OF THE ROOM DIMMER LEVELS. LIGHTING FIXTURES ON DAYLIGHT ZONE ARE LABELED WITH A LOWERCASE "d".
E. AUTO OFF ALL FIXTURES WITHIN 20 MINUTES OF OCCUPANTS LEAVING. AUTO OFF FOR THE HEATPUMP SERVING THIS SPACE SHALL ALSO BE INCLUDED WITHIN 20 MINUTES OF OCCUPANTS LEAVING. IF TWO OR MORE CLASSROOMS ARE SERVED BY ONE HEATPUMP, OCCUPANCY IN EITHER ROOM SHALL KEEP THE HEAT PUMP ON.
F. NORMAL POWER FAILURE EMERGENCY LIGHTING SHALL REVERT TO 100% ON.



2 CATWALK LIGHTING AND POWER PLAN
SCALE: 1/8" = 1'-0"



1 ELECTRICAL LIGHTING AISLE AND STEP LIGHT PLAN
SCALE: 1/8" = 1'-0"

ELECTRICAL - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	BASIS OF DESIGN	EQUAL MANUFACTURERS	MOUNTING	LAMPS / CCT	MINIMUM LUMENS	MAXIMUM WATTAGE	VOLTAGE	REMARKS
A2	2'X4' LED CONTEMPORARY ARCHITECTURAL TROFFER WITH ACRYLIC CURVED CENTER LENS	HUBBELL - LCAT24-80-35-VW-G-E-U	LITHONIA-2BLT4, METALUX-24CZ2, DAYBRITE-2-FGEZ	RECESSED GRID	LED / 3500K	3124	28	120	
A2D	2'X4' LED CONTEMPORARY ARCHITECTURAL TROFFER WITH ACRYLIC CURVED CENTER LENS. PROVIDE WITH 0-10V DIMMING TO 1%	HUBBELL - LCAT24-80-35-VW-G-E-U-DIM	LITHONIA-2BLT4, METALUX-24CZ2, DAYBRITE-2-FGEZ	RECESSED GRID	LED / 3500K	3124	28	120	
A2E	2'X4' LED CONTEMPORARY ARCHITECTURAL TROFFER WITH ACRYLIC CURVED CENTER LENS. PROVIDE WITH 1400 LUMEN BATTERY PACK INSTALLED.	HUBBELL - LCAT24-80-35-VW-G-E-U-ELL14	LITHONIA-2BLT4, METALUX-24CZ2, DAYBRITE-2-FGEZ	RECESSED GRID	LED / 3500K	3124	28	120	
A5	2X2 LED CONTEMPORARY ARCHITECTURAL TROFFER WITH ACRYLIC CURVED CENTER LENS. PROVIDE WITH DIMMING.	HUBBELL - LCAT22-35-LW-G-ED1-U	LITHONIA-2BLT4, METALUX-24CZ2, DAYBRITE-2-CT-G	RECESSED GRID	LED / 3500K	3063	23	120	
C1	10" DMX LED CYLINDER, DMX CONTROL, AND BLANK HOUSING. DIM TO LESS THAN .1%	PRESCOLITE - MC10LED-P-BL-27K-8-MVOLT-DMX-XFL55-SL-BL	CALIBER-C08Q, PORTFOLIO-LSRB840, SSL-SSC10-17	CEILING / AIRCRAFT	LED / 2700K	8000	78	120	
C2	6" ROUND LED CYLINDER, DMX CONTROL, AND BLANK HOUSING.DIM TO LESS THAN 1%	PRESCOLITE -LTC-6RDW-CM-55L-27K-8-XX-DMX-X-BL	CALIBER-C95, PORTFOLIO-LER6B40, SSL-SSC6I	CEILING / AIRCRAFT	LED / 2700K	5500	54	120	
C3	6" ROUND LED CYLINDER AND BLANK HOUSING. DIM TO LESS THAN 1%	PRESCOLITE -LTC-6RDW-CM-55L-35K-8-XX-DM01-X-BL	CALIBER-C95, PORTFOLIO-LER6B40, SSL-SSC6I	CEILING / AIRCRAFT	LED / 3500K	5500	54	120	
C3E	6" ROUND LED CYLINDER AND BLANK HOUSING. PROVIDE WITH EMERGENCY BATTERY	PRESCOLITE -LTC-6RDW-CM-55L-35K-8-XX-DM01-X-BL-EM	CALIBER-C95, PORTFOLIO-LER6B40, SSL-SSC6I	CEILING / AIRCRAFT	LED / 3500K	5500	54	120	
D3	6" RECESSED CAN LIGHT FIXTURE. PROVIDE BAR HANGERS	GOTHAM - EV06-40/20/AR/MD/LSS/MVOLT/GZ1	PRESCOLITE LTR-6RD, PORTFOLIO-LD6B20, DAYBRITE-6R-N	RECESSED GYPBOARD CEILING	LED / 3500K	2000	19	120	
D3E	6" RECESSED CAN LIGHT FIXTURE. PROVIDE BAR HANGERS. PROVIDE WITH EMERGENCY BATTERY PACK	GOTHAM - EV06-40/20/AR/MD/LSS/MVOLT/GZ1/EL	PRESCOLITE LTR-6RD, PORTFOLIO-LD6B20, DAYBRITE-6R-N	RECESSED GYPBOARD CEILING	LED / 3500K	2000	19	120	
D4	6" RECESSED CAN LIGHT FIXTURE. DIMMING WITH DMX LESS 1%	GOTHAM - EV06-27/20/AR/MD/LSS/MVOLT-ED6B-EL	PRESCOLITE LTR-6RD, PORTFOLIO-LD6B20, DAYBRITE-6R-N	RECESSED GYPBOARD CEILING	LED / 2700K	2000	19	120	
D5	6" RECESSED CAN LIGHT FIXTURE. DIMMING	GOTHAM - EV06-35/40/AR/ND/LSS/MVOLT-GZ1-	PRESCOLITE LTR-6RD, PORTFOLIO-LD6B20, DAYBRITE-6R-N	RECESSED GYPBOARD CEILING	LED / 3500K	4000	39	120	
D6	6" RECESSED CAN LIGHT FIXTURE.	GOTHAM - EV06-27/20/AR/MD/LSS/MVOLT-GZ1	PRESCOLITE LTR-6RD, PORTFOLIO-LD6B20, DAYBRITE-6R-N	RECESSED GYPBOARD CEILING	LED / 3500K	2000	19	120	
D6E	6" RECESSED CAN LIGHT FIXTURE.	GOTHAM - EV06-27/20/AR/MD/LSS/MVOLT-GZ1-EM	PRESCOLITE LTR-6RD, PORTFOLIO-LD6B20, DAYBRITE-6R-N	RECESSED GYPBOARD CEILING	LED / 3500K	2000	19	120	
EX1	LED SINGLE SIDED EXIT SIGN. RED LETTERS	HUBBELL - EVE-U-R-W-E	LITHONIA-LHQM, SUTE-LITES - APX, CHLORIDE-CLX	CEILING MOUNTED	N/A		2	120	
EX2	LED DOUBLE SIDED EXIT SIGN. RED LETTERS	HUBBELL - EVE-U-R-W-E	LITHONIA-LHQM, SUTE-LITES - APX, CHLORIDE-CLX	CEILING MOUNTED	N/A		2	120	
F4	2'X4' LED FLAT PANEL	COLUMBIA - CFP24-4135	LITHONIA-CPANL, METALUX - 24FP38, DAYBRITE-2SB	RECESSED GRID	LED / 3500K	4069	35	120	
FL1	LED GROUND MOUNTED FLOOD LIGHT	HUBBELL - RFL5-360L-130-4K7-M-UNV-K-X-X-SP-DIM	NO EQUALS	CONCRETE POLE BASE	LED/4000K	18520	133	120	
K1	2'X2'X4' LED STRIPLIGHT	LITHONIA - ZL1D-48-3000LM-FST-MVOLT-35K-80CRI-WH	COLUMBIA - MPS4, METALUX - 4SNLED, DAYBRITE-FSS	CEILING / AIRCRAFT	LED / 3500K	3000	30	120	
K1E	2'X2'X4' LED STRIP LIGHT WITH EMERGENCY BATTERY	LITHONIA - ZL1D-48-3000LM-FST-MVOLT-35K-80CRI-WH-EM	COLUMBIA - MPS4, METALUX-4SNLED, DAYBRITE-FSS	CEILING / AIRCRAFT	LED / 3500K	3000	30	120	
L10F	3"X10' LED RECESSED LINEAR WITH 1/2" FLANGE FOR GYPBOARD CEILING. CONTRACTOR TO DETERMINE LENGTH IN FIELD SO FIXTURE WILL RUN WALL TO WALL	PINNACLE-EV3D-WHE-35-10'-FL-U-EE1-1-0-W-X-X	LEDALITE-39	RECESSED GYPBOARD CEILING	LED / 3500K	500 LM/FT	148	120	
L11	3"X11' LED RECESSED LINEAR. CONTRACTOR TO DETERMINE LENGTH IN FIELD SO FIXTURE WILL RUN WALL TO WALL	PINNACLE-EV3D-WHE-35-11'-GX-U-EE1-1-0-W-X-X	LEDALITE-39	RECESSED GRID	LED / 3500K	500 LM/FT	53	120	
L12	3"X12' LED RECESSED LINEAR. CONTRACTOR TO DETERMINE LENGTH IN FIELD SO FIXTURE WILL RUN WALL TO WALL	PINNACLE-EV3D-WHE-35-12'-GX-U-EE1-1-0-W-X-X	LEDALITE-39	RECESSED GRID	LED / 3500K	500 LM/FT	58	120	
L12F	3"X12' LED RECESSED LINEAR WITH 1/2" FLANGE FOR GYPBOARD CEILING. CONTRACTOR TO DETERMINE LENGTH IN FIELD SO FIXTURE WILL RUN WALL TO WALL	PINNACLE-EV3D-WHE-35-12'-FL-U-EE1-1-0-W-X-X	LEDALITE-39	RECESSED GYPBOARD CEILING	LED / 3500K	500 LM/FT	58	120	
L13	3"X13' LED RECESSED LINEAR. CONTRACTOR TO DETERMINE LENGTH IN FIELD SO FIXTURE WILL RUN WALL TO WALL	PINNACLE-EV3D-WHE-35-13'-GX-U-EE1-1-0-W-X-X	LEDALITE-39	RECESSED GRID	LED / 3500K	500 LM/FT	62	120	
L16	3"X16'6" LED RECESSED LINEAR. CONTRACTOR TO DETERMINE LENGTH IN FIELD SO FIXTURE WILL RUN WALL TO WALL	PINNACLE-EV3D-WHE-35-16'6"-GX-U-EE1-1-0-W-X-X	LEDALITE-39	RECESSED GRID	LED / 3500K	500 LM/FT	77	120	
L17F	3"X17 LED RECESSED LINEAR WITH 1/2" FLANGE FOR GYPBOARD CEILING. CONTRACTOR TO DETERMINE LENGTH IN FIELD SO FIXTURE WILL RUN WALL TO WALL	PINNACLE-EV3D-WHE-35-17'-FL-U-EE1-1-0-W-X-X	LEDALITE-39	RECESSED GYPBOARD CEILING	LED / 3500K	500 LM/FT	82	120	
L26	3"X26'10" LED RECESSED LINEAR. CONTRACTOR TO DETERMINE LENGTH IN FIELD SO FIXTURE WILL RUN WALL TO WALL	PINNACLE-EV3D-WHE-35-26'10"-GX-U-EE1-1-0-W-X-X	LEDALITE-39	RECESSED GRID	LED / 3500K	500 LM/FT	128	120	
P1	LED AREA LIGHT ON 12'-0" POLE. MATCH EXISITNG LIGHTING INSTALLED IN ELEM. SCHOOL. COLOR TO MATCH EXISTING ELEM SCHOOL	HUBBELL - RAR-1160L-100-4K7-SQW-UNV (MATCH EXISTING)	NO EQUALS	POLE	LED/4000K	12000	100	120	
TA	4" LED HIGH PREFORMANCE STRIP LIGHT, MOUNTED VERTICAL. PROVIDE WIRE GUARDS AND BLACK FINISH.	PHILLIPS - FSS4-55L-840-UNV-DIM-BK-FSSWG4	COLUMBIA-MPS4-35HL, LITHONIA ZL1D, LUX DYNAMICS STRIP-835	SURFACE WALL VERTICAL	LED / 3500K	6000	45	120	
TAH	4" LED HIGH PREFORMANCE STRIP LIGHT, MOUNTED HORIZ. PROVIDE WIRE GUARDS AND BLACK FINISH.	PHILLIPS - FSS4-55L-840-UNV-DIMBK-FSSWG4	COLUMBIA-MPS4-35HL, LITHONIA ZL1D, LUX DYNAMICS STRIP-835	SURFACE WALL HORZ	LED / 3500K	6000	45	120	
TB	WALL MOUNTED LED LINEAR RGBW GRAZING SYSTEM WITH FROST LENS. PROVIDE ALL ENDCAPS, MOUNTING HARDWARE FOR FIXTURE AND REMOTE DRIVER.	LUMINII - KM-(ESTIMATED 24') -RGBW-MO-C-AH-BK-S-1X2	CALI-LLED8600, KELVIX-409, NOVAFLEXLED-NF-RGBW	SURFACE WALL	LED /RGBW	1561 LM/FT	140	120	CONTRACTOR TO FIELD VERIFY EXACT LENGTH IN FIELD PRIOR TO ORDERING. ESTIMATED LENGTH SHOWN FOR BIDDING ONLY.
TBA	SURFACE MOUNTED BULLET WALL MOUNTED LIGHT. FIXTURES COLOR TO BE BLACK WITH FLAT DARK BLUE LENS	VISATAPRO-1007-B-DBL	SLV LIGHTING - BILAS, WAC LIGHTING MO-LED522F, HYDREL-PINE, LUMOUTDOOR-TCRL15M	SURFACE WALL		1037	50	120	
TD	LED AISLE LIGHT. LIGHT AND 12 VOLT TRANSFORMER BY SEAT MANUFACTURE.	BY OTHERS	N/A	N/A			0	120	
TH1	LED WORK / FLOOD LIGHT. IP65. PROVIDE ALL CLAMPS, CONNECTORS, AND 30" SAFETY CABLE W/SPRING HOOK. BLACK FINISH	OSRAM - KREIOS FLX 90W	PAC LIGHTS-FFLA	PIPE OVER STAGE	LED / 3500K	5000	90	120	
TH2	RGBW LED PAR WITH MOTORIZED ZOOM AND UNIVERAL PSU-BLACK. PROVIDE ALL CLAMPS AND 30" BLACK SAFETY CABLE WITH SPRING HOOK	ALTMAN - AP-150-RGBW-B	CHAUVET PROFESSIONAL - COLORADO SOLO3	PIPE OVER STAGE	LED /RGBW	1600	135	120	
TH4	LED FOUR COLOR SPOTS	ETC - CSSPOTDBS	CHAUVET PROFESSIONAL - OVATION E-910FC	CATWALK	LED /RGBW	6932	166	120	
TH5	LED FOUR COLOR SPOTS	ETC - CSSPOTDBS	CHAUVET PROFESSIONAL - OVATION E-910FC	OVERSTAGE ELECTRIC 1	LED /RGBW	6932	166	120	
TS	5"x5" LED STEP LIGHT	TIVOLI - VET-27-B-NL-1	LIGMAN-URA-40531, BEGA-24202, COLE-L111W-AL	RECESSED WALL	LED / 2700K	169	23	120	
W3	LINEAR DIRECT / INDIRECT 2" LED WALL MOUNTED DIMMING 0-10V. WHIITE FINISH	3G LIGHTING - 3G-2WL1-D1-L250-L750-S80-35K-UNV-DIM-FL-ASY-WH-1C	MARK LIGHTING - S2LW1D, AXIS-TB2WD, FINELITE-HP-2-P	SURFACE WALL	LED / 3500K	750 LM/FT	50	120	
W3E	LINEAR DIRECT / INDIRECT 2" LED WALL MOUNTED DIMMING 0-10V. WHIITE FINISH. PROVIDE WITH INTEGRAL BATTERY	3G LIGHTING - 3G-2WL1-D1-L750-L750-S80-35K-UNV-DIM-FL-ASY-WH-1C-EMB	MARK LIGHTING - S2LW1D, AXIS-TB2WD, FINELITE-HP-2-P	SURFACE WALL	LED / 3500K	750LM/FT	50	120	
W4E	WALL MOUNTED EGRESS LIGHT. MATCH EXISITNG LIGHTING INSTALLED IN ELEM. SCHOOL. COLOR TO MATCH EXISTING ELEM SCHOOL	HUBBELL - RWL1-48L-25-4K7-4W-UNV-X	NO EQUALS	SURFACE WALL	LED/4000K	2680	28	120	
W5	LED EXTERIOR WORK LIGHT MOUNTED ROOF TOP UNIT WITH CLEAR GLASS	CANLET-01-12W-LED-W-F	LITHONIA - OLVTWM, HALO COMM-VT11730, STONCO-VWXL	WALL	LED / 3500K	1548	12	120	

GENERAL NOTES (LUMINAIRE SCHEDULE):

A. ALL LUMINAIRES AND COMPONENTS SHALL BE UL LISTED.
B. WHERE LUMINAIRES ARE SHOWN SPLIT-WIRED (HALF EMERGENCY POWER/ HALF NORMAL POWER) ON FLOOR PLANS, LUMINAIRES SHALL BE PROVIDED WITH MULTIPLE ELECTRONIC BALLASTS FOR MULTIPLE POWER CIRCUITS AS INDICATED ON FLOOR PLANS.
C. PROVIDE BALLASTS FOR FIXTURE LAMP SWITCHING AS INDICATED ON LIGHTING FLOOR PLANS. WHERE A SINGLE FIXTURE IS POWERED FROM NORMAL AND EMERGENCY POWER, HALF OF THE LAMPS WITH A MINIMUM OF TWO LAMPS SHALL BE ON EMERGENCY POWER.
D. CONTRACTOR SHALL FOCUS, AIM AND ADJUST LUMINAIRES UNDER THE SUPERVISION AND DIRECTION OF THE ENGINEER AND ARCHITECT. ALLOW LABOR FOR FINAL FOCUS AND ADJUSTMENTS AFTER DARK. LIFTS AND SCAFFOLDING SHALL BE AVAILABLE.
E. ALL LAY-IN FIXTURES SHALL BE PROVIDED WITH SCREW ON HOLD DOWN CLIPS AND MAXIMUM 6'-0" LONG FLEXIBLE CONDUIT WHIPS.
F. EXIT SIGNS AND FIXTURES THAT ARE HATCHED OR WHERE THE FIXTURE TYPE CONTAINS THE SUFFIX "E" FOR EMERGENCY OPERATION SHALL HAVE AN INTEGRAL 90 MINUTE BATTERY INVERTER IF NOT POWERED FROM AN EMERGENCY GENERATOR.
G. ALL BATTERY POWERED FIXTURES SHALL HAVE TEST SWITCHES FACTORY INSTALLED INTEGRAL TO THE REFLECTOR, REMOTE TEST SWITCHES WILL NOT BE ACCEPTED.

No.	Revisions / Submissions	Date
1	ADDENDUM 1	3/15/2021

LWC INCORPORATED
434 East First Street Dayton, OH 45402 937.223.6500
712 East Main Street Richmond, IN 47374 765.966.3546

CMTA
222 E. 14th Street. Floor 4. Cincinnati, Ohio 45202
513 429 4404 f 513 429 4693 www.cmta.com

WAYNE LOCAL SCHOOLS

WAYNESVILLE PERFORMING ARTS CENTER

625 DAYTON RD.
WAYNESVILLE, OH 45068

ELECTRICAL ELARGED PLANS AND LUMINAIRE SCHEDULE

STATE OF OHIO — JEFFREY ALLEN MILLARD — E-67912 — REGISTERED PROFESSIONAL ENGINEER

Comm. No.	Date
18620.00	2021/03/01
Drawn: RAR	Drawing No.: E600
Checked: JAM/JRH	