

# TOWN OF GLASTONBURY

GL-2013-05

## HOPEWELL ELEMENTARY SCHOOL – BOILER REPLACEMENT ADDENDUM #1 APRIL 12, 2012

Bid Due Date 04/17/2012 @ 11:00  
A.M.

The attention of bidders submitting proposals for the above-referenced project is called to the following Addendum to the specifications. The items set forth herein, whether of omission, addition, substitution or other change, are all to be included in and form a part of the proposed Contract Documents for the work. Bidders shall acknowledge this Addendum in the Bid Proposal by inserting its number on Page BP-1.

Question #1: Who is responsible for asbestos abatements?

Answer: The Town will abate any existing asbestos encountered under this project.

Question #2: Which will be the roof that will be used as a reference when removing the chimney?

Answer: The existing Chimney shall be removed down to 3'-0" above the highest adjacent roof.

Question #3: Is the kitchen hood in the project.

Answer: All work is in the base bid. See ADD 1-7 below.

Question #4: What happens to gas piping in kitchen hood?

Answer: Gas piping gets re-routed as part of the base bid.

Question #5: M2.0 show infilling louver space with brick and rigid board. Which one is it?

Answer: Area where louvers are removed will be bricked up. Brick to match existing. Please refer to ADD1-11.

Question #6: Can the chimney be capped with something other than 8" concrete?

Answer: Bidders must bid on scope but can provide substitute solution with cost difference.

### SPECIFICATIONS:

ADD 1-1 On the Bid Proposal, Contractor shall include unit price for replacing valves in the existing tunnel. The existing tunnel is considered confined space and the price shall account for this condition. The price shall be for replacing the valve including 10'-0" of associated piping and insulation. Unit price shall be for ¾", 1", 1 ¼", 1 ½", 2" and 2 ½" valves.

ADD 1-2 Add Section 02070, Selective Demolition

ADD 1-3 Add Section 04500, Masonry Restoration

ADD 1-4 Add section 04900, Masonry Cleaning

ADD 1-5 Add Section 07190, Water Repellents

ADD 1-6 Add Section 15900, Variable Frequency Drives for HWAC Equipment

ADD 1-7 Add Asbestos Plan Management

DRAWINGS:

- ADD 1-8 Drawing MD 1.1: Mechanical Demolition Work Symbols: Note 21 – Delete Add Alternate. Kitchen Hood removal shall be included in the base bid. Note 22 – Add new note. Please refer to MSK-1.
- ADD 1-9 Drawing MD 1.3: Kitchen Hood scope of work clarification. Kitchen hood replacement shall be included in the base bid. Please refer to MSK-1
- ADD 1-10 Drawing ME 1.3: - Kitchen Hood scope of work clarification. Please refer to MSK-2  
- Air Handling Unit Replacement scope of work clarification. Please refer to MSK-3.
- ADD 1-11 Drawing M 2.0: - Part Plan Boiler Room – Mechanical New Work: Existing louver opening shall be patch with masonry to match existing (typical for both louvers).  
- Flue for the existing domestic water heater shall be Type “B” Vent not Stainless Steel.  
- Coordinate with the gas company for consolidating the existing meters. This contractor shall provide emergency shut-off valve.  
- Boiler Venting Part Plan – Elevation View; Extend vertical flue 6’-0” above the roof. Provide guide wires.
- ADD 1-12 Drawing M 3.0: - Heating and Ventilating Unit – Add D/X cooling coil. Please refer to MSK-4.  
- Exhaust Fan Schedule: - Revise Note7 to read: Manufacturer shall provide RCG 28 Roof Curb, hinged base kit, grease terminator, and VE-29 vented extension. Patch to match remaining roof opening.  
- Delete Note 9.  
- Gas Fired Water Heater Stack Detail – Extend stack 6’-0” above the roof.
- ADD 1-13 Drawing M3.1: - Constant Air Volume System Control Diagram – Add damper in the return air duct. Delete Air Flow Station. Please refer to MSK-5.  
- Constant Air Volume System Gymnasium - Delete Air Flow Station.
- ADD 1-14 Roof Penetrations – General: The existing fully adhered EPDM roof assembly (Firestone) is currently under warranty. All modifications to this roof, including penetrations, must be completed by a trade contractor certified to modify/alter an existing fully adhered Firestone EPDM roof assembly without voiding or otherwise modifying the existing warranty. Coordinate all work with the HVAC Contractor and take special care to prevent any water or air into and thru the existing roof assembly.

Note: This addendum consists of 42 pages including the above text.

END OF TEXT

## ASBESTOS MANAGEMENT PLAN UPDATE

HOPEWELL SCHOOL  
1068 Chestnut Road  
Glastonbury, Connecticut

DATE: March 29, 2005

PLANNER: Mark F. Granville  
Brooks Laboratories, Inc.  
9 Isaac Street  
Norwalk, CT 06850  
(203)853-9792

  
\_\_\_\_\_  
CT licensed Inspector/Planner  
License #000009 expires 5-31-05

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BUILDING: (7) Hopewell School

A. RECOMMENDED RESPONSE ACTIONS

1. Removal  
none
2. Repair  
none
3. Enclosure  
none
4. Encapsulation  
none
5. Operations & Maintenance  
All asbestos-containing building materials as listed in the 2005 three-year reinspection report (attached).

B. JUSTIFICATION OF RECOMMENDED RESPONSE ACTIONS

Materials are in good condition and most are non-friable. No friable materials are in general public access areas. In this case, Operations & Maintenance is the least burdensome method which will protect public health.

C. SCHEDULE AND RESOURCES FOR IMPLEMENTATION

1. Removal
2. Repair
3. Enclosure
4. Encapsulation
5. Operations & Maintenance Program  
Estimated cost: \$750 per year  
Start Date: ongoing  
Completion Date: upon removal of all ACBM from building

## THREE YEAR REINSPECTION OF ACBM

HOPEWELL SCHOOL  
1068 Chestnut Road  
Glastonbury, Connecticut

DATE: February 24, 2005

INSPECTOR: Mark F. Granville  
*Brooks Laboratories*  
120 Forbes Avenue  
New Haven, CT 06512  
(203)466-3579

  
\_\_\_\_\_  
CT licensed Inspector/Planner  
License #000009 expires 5-31-05

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## INTRODUCTION

This report contains the results of a three-year reinspection of asbestos-containing building materials (ACBM) following the protocols of the State of Connecticut Department of Public Health (DPH) "Asbestos-Containing Materials in Schools" regulation.

The information presented here was compiled by Mark F. Granville, an accredited asbestos inspector under the EPA model accreditation plan and the DPH training requirements for asbestos consultation services. Mr. Granville completed his original accreditation training at the Tuft's University Asbestos Information Center, Center for Environmental Management, Medford, Massachusetts in 1987. He is currently operating under an annual refresher certificate from ATC Associates, West Springfield, Massachusetts and is licensed in the State of Connecticut as an Asbestos Building Inspector/Management Planner.

Friable ACBM and thermal system insulation (TSI) have been assessed according to EPA and DPH regulations. These regulations allow TSI that has retained its structural integrity and that has an undamaged protective jacket or wrap that prevents fiber release to be treated as nonfriable during inspections and reinspections. TSI meeting the "nonfriable" criteria has been assessed as "no damage" and "encapsulated". Such material is reported as friable on the "Building Information Sheet".

The "Building Information Sheet" summarizes the extent of the facility at the time of this reinspection. Modular classrooms have been added since the last reinspection.

## ASBESTOS MANAGEMENT HISTORY

Hopewell School was inspected for asbestos-containing materials in 1987 and 1988 under the State of Connecticut Department of Education "School Asbestos Inspection and Abatement" regulations, was reinspected in 1990 under the U.S. Environmental Protection Agency (EPA) "Asbestos-Containing Materials in Schools" regulations, and was reinspected again in 1993, 1996, and 2000.

The boiler breach and hot water tank were abated in summer 1985. Pipe insulation was removed from the boiler room in summer 1985.

The following abatements were carried out during a 1995-1997 renovation & addition project: (1) mud-type insulation was removed from 5 pipe fittings above the ceiling in corridor outside 107A, from 15 pipe fittings below the multi-purpose room platform, from 1 pipe fitting above ceiling in corridor outside 129; (2) mud-type insulation was removed from pipe fittings in lavatory and sink chase walls in main office, health office, corridor outside gym, 111, 116, rooms 119, 119C, 123, 123A, 124, 126, 126A, 129A, 129, 130, 131, 137, 138; (3) floor tile & mastic were removed from areas in front of lavatory and in front of sink or where wall demolition was scheduled in entry lobby, main office, health office, multi-purpose room platform, doorway at gym/kitchen, corridor outside 113-115, 121-122, rooms 108, 109, 113, 115, 118, 119, 119C, 123, 123A, 124, 126, 126A, 129A, 129, 130, 131, 137, 138, 140 (approximate total of 2525 SF); (4) transite board was

removed from radiator cases in main office, nurse office, roof soffit outside rooms 126-129A, rooms (approximate total of 368 SF).

Some floor tile and mastic were removed in December 1999.

No bulk samples were collected during this reinspection. The "Summary of Homogeneous Areas" indicates the status of the suspect materials found during this reinspection based on the previous inspections found in Appendices B and C of the Asbestos Management Plan.

#### **STATEMENT OF LIMITATIONS**

Inspection of school buildings for suspect asbestos-containing building materials under the Federal and State asbestos-in-schools regulations generally does not include demolition of structures to find hidden materials. It is thus possible that renovation or demolition activities not preceded by a NESHAP level asbestos inspection may uncover previously unknown suspect materials. Such possibilities include, but are not limited to: roping between sections of a previously abated sectional boiler, (2) insulation board behind fire brick in the base of boilers, (3) pipe insulation inside wall chases, (4) floor tile and mastic under other flooring, (5) glue daubs under acoustic tile, (6) glue daubs behind chalk boards and/or tack boards, (7) insulation inside walls.







## SUMMARY OF HOMOGENEOUS AREAS

AREA	MATERIAL	LOCATION/FUNCTIONAL SPACE	TYPE	ACM?	METHOD
701	breech insulation	boiler room	TSI	no	removed
702	HW tank insulation	boiler room	TSI	no	removed
703	pipe insulation	boiler room	TSI	no	removed
704	plaster pipe fitting insulation	above ceilings	TSI	yes	sample
705	pipe fitting insulation	tunnels	TSI	no	removed
706	pipe fitting insulation	stage	TSI	no	removed
		room 23A	TSI	no	removed
707	pipe fitting insulation	stage fan room	TSI	yes	assume
708	roof drain insulation	stage	TSI	no	removed
709	2x4 suspended ceiling panels with random gouged surface and small holes	offices, health, hallways, classrooms	MISC	no	excluded
710	floor tile and black mastic				
	12x12 floor tile mastic	rooms	MISC	yes	sample
	9x9 floor tile mastic	room S2	MISC	yes	sample
	12x12 floor tile	hallways and rooms	MISC	yes	assume
	12x12 brown floor tile	custodial office	MISC	yes	assume
	12x12 white floor tile with blue accents	health, art, cafeteria	MISC	no	excluded
711	sheetrock plaster	offices, health, classroom doors	MISC	no	sample excluded
712	taping compound	offices, health, classroom doors	MISC	no	sample excluded
713	white insulation	stage light wires	MISC	yes	assume
	all materials	1997 additions		no	excluded
	blue cove base	throughout school	MISC	no	excluded

**TYPE** indicates whether the material is Miscellaneous (MISC), Thermal System Insulation (TSI), or Surfacing Material (SURF).

**ACM?** indicates whether the material does (yes) or does not (no) contain more than 1% asbestos.

**METHOD** indicates whether the material was bulk tested (sample), is assumed to contain asbestos (assume), is a non-asbestos replacement material installed after asbestos abatement (removed), is a recently installed material shown to be asbestos free on the manufacturer's data sheet (new), or is a material installed during construction or renovation after 1988 that has been excluded from being suspect by an architect or engineer statement (excluded).

DATE  
 February 24, 2005

**BUILDING NUMBER AND NAME**  
 7 Hopewell School

**BUILDING LOCATION/ADDRESS**  
 1068 Chestnut Hill Road  
 Glastonbury, Connecticut

**NAME OF LOCAL EDUCATION AGENCY**  
 Glastonbury Public Schools

Number of Floors in This Building	<input type="text" value="1"/>	Original Construction Date	<input type="text" value="1961"/>
Number of Basement Levels	<input type="text" value="0"/>	Addition/Renovation Date 1	<input type="text" value="1997"/>
Number of Attic Levels	<input type="text" value="0"/>	Addition/Renovation Date 2	<input type="text"/>
Number of Other Levels	<input type="text" value="1"/>	Estimated Gross Square Feet	<input type="text" value="54,898"/>

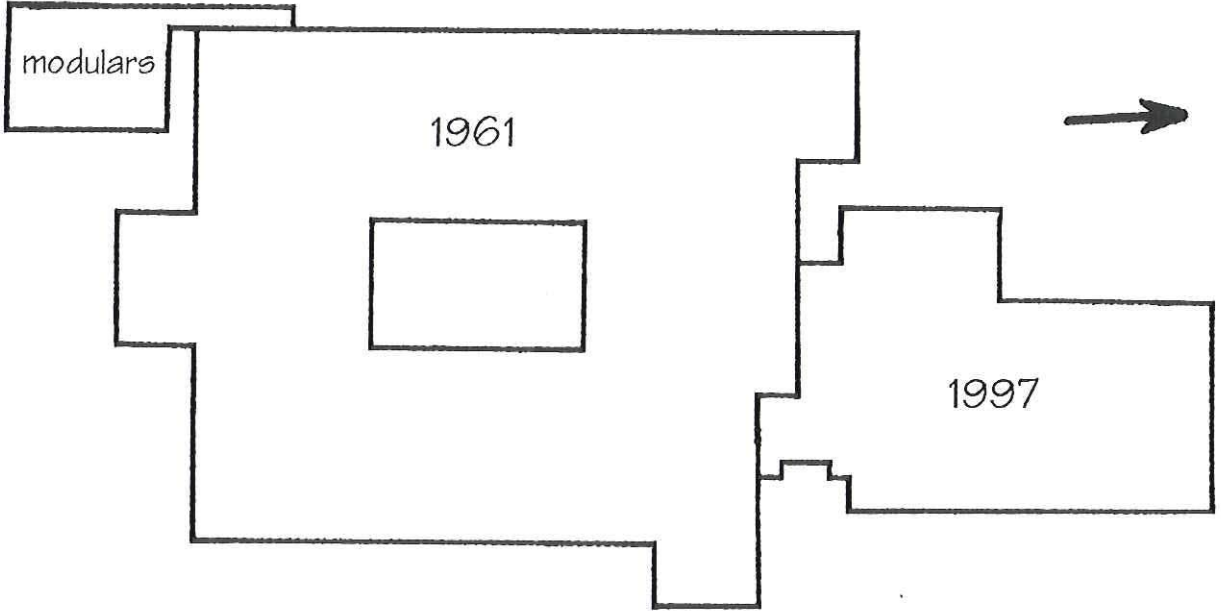
**Building Construction Type**  
 masonry

Building Use	%Floor Space

FRIABLE  
 ACM  
 PRESENT

NON-FRIABLE  
 ACM  
 PRESENT

Friable ACM includes intact TSI



SECTION 02070

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.
- B. The General Requirements in Section 15010 shall also govern the work under this Section.
- C. Examine all drawings and data and coordinate the work of this Section with all related and adjoining work.

1.2 SUMMARY

- A. This Section requires the selective removal and subsequent off-site disposal of the following:
  - 1. Removal of a portion of the existing masonry chimney as indicated on drawings or required to accommodate new construction.
- B. Related Work Specified Elsewhere, including but not limited to:
  - 1. Section 04500 – Masonry Restoration
  - 2. Section 04900 – Masonry Cleaning
  - 3. Section 07190 – Water Repellents

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Owner's Representative prior to start of work.

1.4 JOB CONDITIONS

- A. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
- B. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Storage or sale of removed items on site will not be permitted.
- C. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.
1. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.
  2. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
  3. Protect floors with suitable coverings when necessary.
  4. Construct temporary insulated dust-proof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dust-proof doors and security locks.
  5. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
  6. Remove protections at completion of work.
- D. Damages: Promptly repair damages caused to adjacent facilities by demolition work.
- E. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
1. Do not close, block, or otherwise - obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- F. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
1. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
- G. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.
1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.
  - 1. Cease operations and notify Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
  - 2. Cover and protect furniture, equipment, and fixtures from soilage or damage when demolition work is performed in areas where such items have not been removed.
  - 3. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.
    - a. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shutdown of service is necessary during changeover.

3.2 DEMOLITION

- A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
  - 1. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
  - 2. Demolish foundation walls to a depth of not less than 12 inches below existing ground surface. Demolish and remove below-grade wood or metal construction. Break up below-grade concrete slabs.
  - 3. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.
- B. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.3 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from building site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose off site.
  - 1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

2. Burning of removed materials is not permitted on project site.

3.4 CLEANUP AND REPAIR

- A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.
  1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 02070

SECTION 04500

MASONRY RESTORATION

PART 1 - GENERAL

1.1 GENERAL

- A. The General Provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.
- B. The General Requirements in Section 15010 shall also govern the work under this Section.
- C. Examine all drawings and data and coordinate the work of this Section with all related and adjoining work.

1.2 DESCRIPTION OF WORK

- A. This Section includes all labor, materials and equipment required to complete all masonry restoration and related items as shown on the Contract Documents and specified herein, including, but not limited to, the following:
  - 1. Repointing the existing brick masonry chimney.

1.3 RELATED SECTIONS

- A. Section 02070 – Selective Demolition
- B. Section 04900 – Masonry Cleaning
- C. Section 07190 – Water Repellents

1.4 QUALITY ASSURANCE, BRICK TESTS

- A. All tests shall be performed by an independent certified testing laboratory.
- B. All tests shall be in accordance with ASTM C-67 latest edition.
- C. Submittals
  - 1. Submit test report and certificate of conformance document for each type and color of brick specified on contract documents for architect's approval.
  - 2. Test reports shall include:
    - a. Compressive strength
    - b. 24 hour cold water absorption
    - c. 5 hour boil absorption
    - d. Saturation coefficient
    - e. Initial Rate of Absorption (I.R.A.)
    - f. Efflorescence
    - g. Weather classification



3. Certificate of conformance shall state that brick meets or exceeds applicable ASTM specifications indicated herein.

## PART 2 - PRODUCTS

### 2.1 BRICK

- A. All brick shall match color, texture to existing brick.
- B. ASTM C-652 latest edition, Grade SW, Type HBS or better.
- C. Dimensions to match existing.
- D. Minimum compressive strength 9,000 psi.
- E. Maximum Saturation Coefficient 0.78.
- F. Minimum IRA 6 g/30 sq. in.
- G. Maximum IRA 30 g/30 sq. in. Where IRA exceeds 30 g/30 sq. in., pre-wetting brick is recommended.
- H. Shapes; where special shapes are shown on architectural drawings, manufacturer shall provide shop drawings for architect's approval prior to manufacturing shapes. Chimney flue lining shall match existing.

### 2.2 MORTAR

- A. Mortar shall be Type S consisting by proportion:
  - 1 part portland cement (ASTM C-150 Type I or II, Low Alkali), less than 6 months old
  - 1/2 part hydrated lime (ASTM C-207)
  - 4-1/2 parts sand (ASTM C-144)

## PART 3 - EXECUTION

### 3.1 SAMPLE TEST PANEL

- A. Expedite cleaning and repointing an area approximately 12" x 12" to be utilized for comparison and approval.
- B. Sample panel for chimney reconstruction shall be 12" x 12" showing the proposed color range, texture, bond, mortar, workmanship, cleaning, and water repellents where applicable.

- C. Final brick selection shall be made only following architect's review of sample panel.
- D. Brick from manufactured material for project shall be shipped to site and sample panel erected.
- E. No brick shall be shipped from manufacturer to site until architect's acceptance of job panel which has been erected from actual material for project. This panel shall replace the sample panel and shall remain on site throughout construction, and become the project standard for bond, mortar, workmanship, and appearance.

3.2 PROTECTION OF EXISTING CONSTRUCTION

- A. Contractor must protect existing construction, primarily roofing, while working from those areas affected. Protective plywood must be placed over a layer of "Homasote" over the affected roof surface. Contractor must repair damaged roofing to the satisfaction of the Architect resulting from this work.

3.3 REPOINTING

- A. All loose, open, deteriorated and stone mortar joints in all elevations of the existing building will be cut, brushed clean, washed down and repointed. Cut joints to a depth of approximately 1" or to solid substrate (deeper if necessary). Care must be exercised no to damage the existing brick edge. All dust and debris must be removed from the joint brushing or blowing with air.
- B. All cement mortar used in repointing work shall be modified with Duralcast 202, polymeric mortar modified, as manufactured by A. H. Harris and Sons, New Britain, CT, or equal.
- C. All surfaces to receive Duralcast 202 must be clean, sound, and free of any material or coatings which might interfere with adhesion. Porous substrate, such as concrete or mortar, must be thoroughly wet down before applying Duralcast 202 Modified Mortar.
- D. Severely deteriorated areas shall be completely removed and rebuilt to match existing. Severely deteriorated brick where face has spalled away shall be removed and replaced. New brick shall match existing in color and type. Samples must be presented for approval by Architect.
- E. Mortar used for repointing shall be as follows:

- | 1. | <u>Component</u> | <u>Parts by Volume</u> |
|----|------------------|------------------------|
|    | Portland Cement  | 1                      |
|    | Lime             | 2                      |
|    | Sand             | 6 to 9                 |
- 2. Lime is to be ASTM C-207, Type S, hydrated lime.
  - 3. Cement is to be ASTM C-150, Type I or Type II White Portland Cement, fresh stock of the same standard brand.
  - 4. Sand is to be ASTM C-144 clean "Mason's Sand" of lightest color obtainable - 100X to pass eight (8) sieve, not over 30% to pass fifty (50) sieve.
  - 5. Water is to be drinking water.

- F. The joints to be pointed should be dampened to ensure good bond. All surface water must be absorbed by the brick. Add water to the pre-hydrated mortar to bring to a workable consistency (somewhat dryer than conventional mortar). Pack the mortar tightly into the joints in thin layers, ¼" max. Each layer should become "thumbprint" hard before applying the next layer. After the last layer of mortar is "thumbprint" hard, tool the joints to match the existing profile.

3.4 REMOVAL OF RUBBISH

- A. Subcontractor for masonry restoration work shall cooperate with the General Contractor in cleaning up his waste periodically and dumping it where indicated by the General Contractor.

END OF SECTION 04500

SECTION 04900

MASONRY CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.
- B. The General Requirements in Section 15010 shall also govern the work under this Section.
- C. Examine all drawings and data and coordinate the work of this Section with all related and adjoining work.

1.2 SECTION INCLUDES

- A. Restoration cleaning of exterior masonry, stone & concrete surfaces by use of chemical restoration cleaners.

1.3 RELATED SECTIONS

- A. Section 02070– Selective Demolition
- B. Section 04500– Masonry Restoration
- C. Section 07190 – Water Repellents

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer’s product data sheets on all products to be used for the work.
- B. Applicator Qualifications: Submit qualifications of applicator.
  - 1. Certification that applicator is experienced in the application of the specified products.
  - 2. List of recently completed exterior masonry restoration cleaning projects, including project name and location, names of owner and architect, and description of cleaning products used, substrates, environmental regulations, and application procedures.
- C. Environmental Regulations: Describe testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes and cleaning effluents. Describe any hazardous materials to be cleaned from substrates. Describe types of coatings and substrates. Submit applicable local environmental regulations.
- D. Protection: Describe methods for protecting surrounding areas, landscaping, building occupants, pedestrians, vehicles, and non masonry surfaces during the work from contact with chemical restoration cleaners, residues, rinse water, fumes, wastes, and cleaning effluents.

- E. Surface Preparation: Describe surface preparation to be completed before application of restoration cleaners.
- F. Application: Describe application procedures of restoration cleaners.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications:
  - 1. Experienced in the application of the specified products.
  - 2. Employs persons trained for the application of the specified products.

1.6 ENVIRONMENTAL REGULATIONS

- A. Comply with applicable federal, state, and local environmental regulations regarding testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes and cleaning effluents.

1.7 TEST PANELS

- A. Before full-scale application, review manufacturer's product data sheets to determine the suitability of each product for the specific surfaces. Apply each restoration cleaner to test panels to determine dilution rates, dwell times, number of applications, compatibility, effectiveness, application procedures, effects of pressure rinsing, and desired results.
- B. Apply restoration cleaners to test panels in accordance with manufacturer's instructions. Allow 48 hours or until test panels are thoroughly dry, before evaluating final appearance and results. Do not begin full-scale application until test panels are inspected and approved by the Architect.
  - 1. Size: Minimum 4 feet by 4 feet each.
  - 2. Locations: As determined by the Architect.
  - 3. Restoration Cleaners: Number of test panels as required to completely test each restoration cleaner with each type of substrate and with each type of material or stain to be cleaned.
- C. Test all cleaning effluents generated by the restoration cleaning of the test panels to determine any hazardous characteristics. Comply with applicable federal, state, and local environmental regulations regarding testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes.
- D. Retain and protect approved test panels in undisturbed condition during the work of this section, as a standard for judging the restoration cleaning work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

- B. Storage and Handling: Store containers upright in a cool, dry, well ventilated place, out of the sun. Store away from all other chemicals and potential sources of contamination. Keep lights, fire, sparks, and heat away from containers. Do not drop onto or slide across sharp objects. Keep containers tightly closed when not in use. Store and handle materials in accordance with manufacturer's instructions.

1.9 PROJECT CONDITIONS

- A. Do not clean masonry surfaces when temperatures are below freezing or will be overnight, to avoid harm to masonry. Clean masonry surfaces only when air and masonry surface temperatures are 40°F and above. Allow adequate time for masonry to thaw if freezing conditions exist prior to application.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Prosoco, Inc., PO Box 171677, Kansas City, Kansas 66117, or approved equal.

2.2 RESTORATION CLEANERS

- A. BioWash: "Enviro Klean® BioWash". General purpose is to remove a broad spectrum of biological deposits from brick, terra cotta, sandstone, granite, and many other masonry surfaces. Dissolves heavy atmospheric soiling. Suitable for most masonry and stone surfaces.
  - 1. Form: Clear liquid.
  - 2. Color: Light amber.
  - 3. pH: 5.5-6.5.
  - 4. Specific Gravity: 1.00.
  - 5. Flash Point: None.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify by examination that masonry surfaces are acceptable to receive the specified restoration cleaners.

3.2 PROTECTION

- A. Protect surrounding areas, landscaping, building occupants, pedestrians, vehicles, and non-masonry surfaces during the work from contact with chemical restoration cleaners, residues, rinse water, fumes, wastes, and cleaning effluents in accordance with manufacturer's instructions.

- B. Test window glass not specified to be replaced for compatibility with chemical cleaning products to determine required protection.
- C. Divert and protect pedestrian and auto traffic.
- D. Avoid wind drifting of spray of chemical cleaning products, residues, and rinse water.

### 3.3 SURFACE PREPARATION

- A. Apply all specified caulking and sealants and allow to cure before chemical cleaning begins.

### 3.4 APPLICATION OF RESTORATION CLEANERS

- A. General: Apply restoration cleaners to substrates in accordance with manufacturer's instructions, environmental regulations, and application procedures determined from test panel results approved by the Architect. Consult manufacturer's instructions for information on equipment to be used and precautions to be taken with the specified products.
- B. Restoration Cleaner:
  - 1. Wet thoroughly the area to be cleaned.
  - 2. Use in concentrate or dilute 1 part concentrated cleaner with up to 10 parts fresh water, according to test panel results. Use the mildest solution that effectively cleans.
  - 3. Apply cleaning solution liberally.
  - 4. Allow dwell time of 2 to 3 minutes.
  - 5. Do not allow cleaning solution to dry on masonry.
  - 6. Mist treated surfaces with water and gently scrub with non-metallic, short – fibered brush to loosen biological soiling.
  - 7. Rinse using low pressure water flood rinse to remove initial residue.
  - 8. Rinse thoroughly using pressure water spray to assure all surface staining and cleaning residues are completely flushed from the treated surface.

### 3.5 FIELD QUALITY CONTROL

- A. Inspection: Inspect the restoration cleaning work with the Contractor, Architect, applicator, and ProSoCo representative, and compare with approved test panels. Determine if the substrates are suitably prepared to start masonry restoration.
- B. Manufacturer's Field Services: Provide the services of a manufacturer's authorized field representative to verify specified products are used, and to ensure test panels, protection, surface preparation, and application of restoration cleaners are in accordance with manufacturer's instructions.

### 3.6 FINAL CLEANING

- A. Clean site of all unused chemical cleaning products, residues, rinse water, wastes, and cleaning effluents in accordance with environmental regulations.
- B. Remove and dispose of all materials used to protect surrounding areas and non-masonry surfaces, following completion of the work of this section.

END OF SECTION 04900



SECTION 07190

WATER REPELLENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.
- B. The General Requirements in Section 15010 shall also govern the work under this Section.
- C. Examine all drawings and data and coordinate the work of this Section with all related and adjoining work.

1.2 SECTION INCLUDES

- A. Application of water repellents to protect above-grade, vertical and horizontal masonry surfaces.

1.3 RELATED SECTIONS

- A. Section 02070 – Selective Demolition
- B. Section 04500 – Masonry Restoration
- C. Section 04900 – Exterior Masonry Restoration Cleaning

1.4 REFERENCES

- A. ASTM D 2369-92 - Test Methods for Volatile Content of Coatings.
- B. ASTM D 3960-93 - Practice for Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
- C. Federal Specification SS-W-110C - Water Repellent, Colorless Silicon, Resin Base.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's product data sheets on all products to be used for the work. Submit description for protection of surrounding areas and non-masonry surfaces, surface preparation, application, and final cleaning.
- B. Applicator Qualifications: Submit qualifications of applicator.
  - 1. Certification stating applicator is experienced in the application of the specified products.
  - 2. List of recently completed water repellent projects, including project name and location, names of owner and architect, and description of products used, substrates, applicable local environmental regulations, and application procedures.

- C. Environmental Regulations: Submit applicable local environmental regulations.
- D. VOC Certification: Submit certification that water repellents furnished comply with regulations controlling use of volatile organic compounds (VOC).

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications:
  - 1. Experienced in the application of the specified products.
  - 2. Employs persons trained for the application of the specified products.

1.7 ENVIRONMENTAL REGULATIONS

- A. Comply with applicable federal, state, and local environmental regulations.

1.8 TEST PANELS

- A. Before full-scale application, review manufacturer's product data sheets to determine the suitability of each product for the specific surfaces. Apply each water repellent to test panels to determine number of applications, coverage rates, compatibility, effectiveness, surface preparation, application procedures, and desired results.
- B. Apply water repellents to test panels in accordance with manufacturer's written instructions. Allow 48 hours or until test panels are thoroughly dry before evaluating final appearance and results. Do not begin full-scale application until test panels are inspected and approved by the Architect.
- C. Test Panel Requirements:
  - 1. Size: Minimum 4 feet by 4 feet each.
  - 2. Locations: As determined by the Architect.
  - 3. Number: As required to completely test each water repellent with each type of substrate to be protected.
- D. Retain and protect test panels approved by the Architect in undisturbed condition during the work of this section, to be used as a standard for judging the water repellent work.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling: Store containers upright in a cool, dry, well ventilated place, out of the sun. Store away from all other chemicals and potential sources of contamination. Keep lights, fire, sparks, and heat away from containers. Do not drop containers or slide across sharp objects. Keep containers tightly closed when not in use. Store and handle materials in accordance with manufacturer's written instructions.

1.10 PROJECT CONDITIONS

- A. Temperature Limitations:
  - 1. Do not apply at surface and air temperatures below 40 F or above 95 F, unless otherwise indicated by manufacturer's written instructions.
  - 2. Do not apply when surface and air temperatures are not expected to remain above 40 F for a minimum of 8 hours after application, unless otherwise indicated by manufacturer's written instructions.
- B. Do not apply under windy conditions such that water repellent may be blown to surfaces not intended.
- C. Do not apply earlier than 24 hours after rain or if rain is predicted for a period of 8 hours after application, unless otherwise indicated by manufacturer's written instructions.
- D. Do not apply to frozen substrate. Allow adequate time for substrate to thaw, if freezing conditions exist before application.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Prosoco, Inc., PO Box 171677, Kansas City, Kansas 66117, (800) 255-4255, (913) 281-2700.

2.2 WATER REPELLENTS

- A. Siloxane PD Water Repellent: "Sure Klean® Weather Seal Siloxane PD". Milky White, penetrating water repellent for use on concrete, brick, and clay tile surfaces. Water-based silane/siloxane water repellent. Protects against moisture intrusion and resists efflorescence, leaching, mildew staining, atmospheric staining, and freeze-thaw spalling. Treated masonry and concrete resists acids, alkalis, acid rain, and carbon crusting.
  - 1. Form: Liquid.
  - 2. Color: Milky White.
  - 3. Specific Gravity: 0.996 (minimum).
  - 4. Active Substance: silane/siloxane.
  - 5. Percent Active Material: 7%.
  - 6. Flash Point: 200 F.
- B. Natural Stone Treatment: "Sure Klean® Weather Seal Natural Stone Treatment". Clear, modified Siloxane water repellent for limestone, marble, un-polished granite and other traditional masonry surfaces. Treatment penetrates deeply to provide long-lasting protection without altering appearance. Treated stone reduces severity of biological staining and degradation caused by fungal growth, mold and mildew.
  - 1. Form: Liquid.

2. Color: Clear, Mild Odor
3. Specific Gravity: 0.805 (minimum).
4. Active Substance: Siloxane.
5. Percent Active Material: 11%.
6. Flash Point: 118 F.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify by examination that masonry and concrete surfaces are acceptable to receive the specified water repellents. Notify the Architect if surfaces are not acceptable to receive the specified products.

#### 3.02 PROTECTION

- A. Protect surrounding areas, landscaping, building occupants, pedestrians, vehicles, and non-masonry surfaces during the work from contact with water repellents, masonry or concrete cleaners if used, residues, rinse water, fumes, wastes, and effluents in accordance with manufacturer's written instructions.
- B. Apply water repellents before installation of windows.
- C. Divert and protect pedestrian and auto traffic.

#### 3.03 SURFACE PREPARATION

- A. Clean all dirt, dust, oil, grease, and other contaminants from surfaces that interfere with penetration or performance of water repellents. Use appropriate masonry or concrete cleaners approved by the water repellent manufacturer where necessary. Rinse thoroughly using pressure water spray to remove cleaner residues. Allow surfaces to dry completely before application of water repellents.
- B. Repair, patch, and fill all cracks, voids, defects, and damaged areas in surface as approved by the Architect. Allow repair materials to cure completely before application of water repellents.
- C. Apply specified sealants and caulking and allow to cure completely before application of water repellents.
- D. Seal all open joints.
- E. Allow new masonry and concrete construction and repointed surfaces to cure for minimum of 28 days before application of water repellents.
- F. Test for pH level according to water repellent manufacturer's written instructions to ensure chemical bond to silicate minerals.

3.04 APPLICATION

- A. Apply water repellents to substrates in accordance with manufacturer's written instructions, environmental regulations, and application procedures determined from test panel results approved by the Architect.
- B. Apply to clean, dry, cured, and properly prepared surfaces approved by the Architect.
- C. Consult manufacturer's written instructions for information on application equipment to be used and precautions to be taken with the specified products.
- D. Do not dilute or alter water repellents, unless otherwise specified. Do Not Dilute in accordance with manufacturer's written instructions.
- E. Do not apply to below-grade surfaces.
- F. Do not apply to asphalt or other non-masonry materials.
- G. Do not apply to painted surfaces.
- H. Do not apply to compensate for structural or material defects in substrates.
- I. Avoid overspray, wind drift, and splash of water repellents.

3.05 FIELD QUALITY CONTROL

- A. Inspection: Inspect the water repellent work with the Contractor, Architect, applicator, and Prosoco representative, and compare with test panel results approved by the Architect. Determine if the substrates are suitably protected by the water repellents.
- B. Manufacturer's Field Services: Provide the services of a manufacturer's authorized field representative to verify specified products are used, and protection, surface preparation, and application of water repellents are in accordance with the manufacturer's written instructions and the test panel results approved by the Architect.

3.06 FINAL CLEANING

- A. Clean site of all unused water repellents, residues, rinse water, wastes, and effluents in accordance with environmental regulations.
- B. Remove and dispose of all materials used to protect surrounding areas and non-masonry surfaces, following completion of the work of this section.
- C. Repair, restore, or replace to the satisfaction of the Architect, all materials, landscaping, and non-masonry surfaces damaged by exposure to water repellents.

END OF SECTION 07190

SECTION 15900 - VARIABLE FREQUENCY DRIVES FOR HVAC APPLICATION

PART 1-GENERAL

1.1 RELATED DOCUMENTS:

- A. The General Provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.
- B. The General Requirements in Section 15010 shall also govern the work under this section.

1.2 DESCRIPTION

- A. This specification is to cover a complete Variable Frequency motor Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.
- B. The drive manufacturer shall supply the drive and all necessary controls as herein specified. The manufacturer shall have been engaged in the production of this type of equipment for a minimum of twenty years. All VFDs installed on this project shall be from the same manufacturer.

1.3 QUALITY ASSURANCE

- A. Referenced Standards:
  - 1. Institute of Electrical and Electronic Engineers (IEEE)
    - a) Standard 519-1992, IEEE Guide for Harmonic Content and Control.
  - 2. Underwriters laboratories
    - a) UL508C
  - 3. National Electrical Manufacturer's Association (NEMA)
    - a) ICS 7.0, AC Adjustable Speed Drives
  - 4. IEC 16800 Parts 1 and 2
- B. Qualifications:
  - 1. VFDs and options shall be UL listed as a complete assembly. VFDs that require the customer to supply external fuses for the VFD to be UL listed are not acceptable. VFDs with requiring additional branch circuit protection are not acceptable. The base VFD shall be UL listed for 100 KAIC without the need for input fusing.
  - 2. CE Mark – The VFD shall conform to the European Union ElectroMagnetic Compatibility directive, a requirement for CE marking. The VFD shall meet product standard EN 61800-3 for the First Environment restricted level.
  - 3. Acceptable Manufactures:
    - a) ABB ACH550 Series

1.4 SUBMITTALS

- A. Submittals shall include the following information:

1. Outline dimensions, conduit entry locations and weight.
2. Customer connection and power wiring diagrams.
3. Complete technical product description include a complete list of options provided. Any portions of the specifications not complied with must be clearly indicated or the supplier and contractor shall be liable to provide all components required to meet the specification.
4. Compliance to IEEE 519 – harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).
  - a) The VFD manufacturer shall provide calculations; specific to the installation, showing total harmonic voltage distortion is less than 5%. Input filters shall be sized and provided as required by the VFD manufacturer to ensure compliance with the IEEE electrical system standard 519. All VFDs shall include a minimum of 5% equivalent impedance reactors, no exceptions.

## PART 2 – PRODUCTS

### 2.01 VARIABLE FREQUENCY DRIVES

- A. The VFD package as specified herein shall be enclosed in a UL Listed Type enclosure, (NEMA rated enclosures are not acceptable) completely assembled and tested by the manufacturer in an ISO9001 facility. The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum.
  1. Environmental operating conditions: 0 – 40<sup>0</sup> C continuous. Altitude 0 to 3300 feet above sea level, up to 95% humidity, non-condensing. All circuit boards shall have conformal coating.
  2. Enclosure shall be rated UL type 1 and shall be UL listed as a plenum rated VFD.
- B. All VFDs shall have the following features:
  1. All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.
  2. The keypad shall include Hand-Off-Auto selections and manual speed control. There shall be fault reset and “Help” buttons on the keypad. The Help button shall include “on-line” assistance for programming and troubleshooting.
  3. There shall be a built-in time clock in the VFD keypad. The clock shall have a battery back up with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. If the battery fails, the VFD shall automatically revert to hours of operation since initial power up. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output relays. The VFD shall have a digital input that allows an override to the time clock (when in the off mode) for a

- programmable time frame. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings. Capacitor backup is not acceptable.
4. The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).
  5. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430-150 for 4-pole motors.
  6. The VFD shall have 5% equivalent impedance internal reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% equivalent impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. VFDs with only one DC reactor shall add an AC line reactor.
  7. The VFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOV's (phase to phase and phase to ground), a capacitor clamp, and 5% equivalent impedance internal reactors.
  8. The VFD shall provide a programmable proof of flow Form-C relay output (broken belt / broken coupling). The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay outputs shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false underload condition.
- D. All VFDs to have the following adjustments:
1. Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed.
  2. Two (2) PID Setpoint controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed loop control. The VFD shall have 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. There shall be two parameter sets for the first PID that allow the sets to be switched via a digital input, serial communications or from the keypad for night setback, summer/winter setpoints, etc. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain setpoint of an independent process (ie. valves, dampers, etc.). All setpoints, process variables, etc. to be accessible from the serial communication network.
  3. Two (2) programmable analog inputs shall accept current or voltage signals.
  4. Two (2) programmable analog outputs (0-20ma or 4-20 ma). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, and other data.
  5. Six (6) programmable digital inputs.
  6. Three (3) programmable digital Form-C relay outputs. The relays shall include programmable on and off delay times and adjustable hysteresis. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC;



- continuous current rating 2 amps RMS. Outputs shall be true Form-C type contacts; open collector outputs are not acceptable.
7. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, time-clock control, or serial communications) the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD digital input and allows motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close.
  8. Two independently adjustable accel and decel ramps with 1 – 1800 seconds adjustable time ramps.
  9. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.
  10. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows higher carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.
  11. The VFD shall include password protection against parameter changes.
- E. The Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (LED and alpha-numeric codes are not acceptable). All VFD faults shall be displayed in English words.
- F. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable):
- Output Frequency
  - Motor Speed (RPM, %, or Engineering units)
  - Motor Current
  - Drive Temperature
  - DC Bus Voltage
  - Output Voltage
- G. The VFD shall include a fireman's override input. Upon receipt of a contact closure from the fireman's control station, the VFD shall operate in one of two modes: 1) Operate at a programmed predetermined fixed speed or operate in a specific fireman's override PID algorithm that automatically adjusts motor speed based on override set point and feedback. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlock, and force the motor to run in one of the two modes above. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation.
- H. Serial Communications

1. The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus, BACnet, Johnson Controls N2 bus, and Siemens Building Technologies FLN. Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be “certified” by the governing authority (i.e. BTL Listing for BACnet). Use of non-certified protocols is not allowed.
  2. The BACnet connection shall be an RS485, MS/TP interface operating at 9.6, 19.2, 38.4, or 76.8 Kbps. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:
    - a. Data Sharing – Read Property – B.
    - b. Data Sharing – Write Property – B.
    - c. Device Management – Dynamic Device Binding (Who-Is; I-AM).
    - d. Device Management – Dynamic Object Binding (Who-Has; I-Have).
    - e. Device Management – Communication Control – B.
  3. Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible.
- I. EMI / RFI filters. All VFDs shall include EMI/RFI filters. The VFD shall comply with standard EN 61800-3 for the First Environment, restricted level with up to 100’ of motor cables. No Exceptions. Certified test lab test reports shall be provided with the submittals.
- J. All VFDs through 60HP shall be protected from input and output power mis-wiring. The VFD shall sense this condition and display an alarm on the keypad. The VFD shall not be damaged by this condition.
- K. OPTIONAL FEATURES – Optional features to be furnished and mounted by the drive manufacturer. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label. The bypass enclosure door and VFD enclosure must be interlocked such that input power is turned off before either enclosure can be opened. The VFD and Bypass as a package shall have a UL listed short circuit rating of 100,000 amps and shall be indicated on the data label.

1. A complete factory wired and tested bypass system consisting of an output contactor and bypass contactor, service (isolation) switch and VFD input fuses are required. Bypass designs, which have no VFD only fuses, or that incorporate fuses common to both the VFD and the bypass will not be accepted
2. Door interlocked padlockable circuit breaker that will disconnect all input power from the drive and all internally mounted options.
- L. The following operators shall be provided:
  - a. Bypass Hand-Off-Auto
  - b. Drive mode selector and light
  - c. Bypass mode selector and light
  - d. Bypass fault reset
  - e. Bypass LDC display, 2 lines, for programming and status / fault / warning indications
1. Motor protection from single phase power conditions - The Bypass system must be able to detect a single phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single phase input power indication. Bypass systems not incorporating single phase protection in Bypass mode are not acceptable.
2. The system (VFD and Bypass) tolerated voltage window shall allow the system to operate from a line of +30%, -35% nominal voltage as a minimum. The system shall incorporate circuitry that will allow the drive or bypass contactor to remain “sealed in” over this voltage tolerance at a minimum.
3. The Bypass system shall NOT depend on the VFD for bypass operation. The bypass shall be completely functional in both Hand and Automatic modes even if the VFD has been removed from the enclosure for repair / replacement.
4. Serial communications – the bypass and VFD shall be capable of being monitored and or controlled via serial communications. Provide communications protocols for ModBus; Johnson Controls N2; Siemens Building Technologies FLN (P1) and BACnet in the bypass controller.
5. BACnet Serial communication bypass capabilities shall include, but not be limited to; bypass run-stop control; the ability to force the unit to bypass; and the ability to lock and unlock the keypad. The bypass shall have the capability of allowing the DDC to monitor feedback such as, bypass current (in amps), bypass kilowatt hours (resettable), bypass operating hours (resettable), and bypass logic board temperature. The DDC shall also be capable of monitoring the bypass relays output status, and all digital input status. All bypass diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote bypass fault reset shall be possible. The following additional bypass status indications and settings shall be transmitted over the serial communications bus – keypad “Hand” or “Auto” selected, and bypass selected. The DDC system shall also be able to monitor if the motor is running under load in both VFD and bypass (proof of flow) in the VFD mode over serial communications or Form-C relay output. A minimum of 40 field parameters shall be capable of being monitored in the bypass mode.

6. Run permissive circuit - there shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, time-clock control, or serial communications) the VFD and bypass shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD system input and allows motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close.
7. The bypass control shall monitor the status of the VFD and bypass contactors and indicate when there is a welded contactor contact or open contactor coil. This failed contactor operation shall be indicated on the Bypass LCD display as well as over the serial communications protocol.
8. The bypass control shall include a programmable time delay for bypass start and keypad indication that this time delay is in process. This will allow VAV boxes to be driven open before the motor operates at full speed in the bypass mode. The time delay shall be field programmable from 0 – 120 seconds.
9. The bypass control shall be programmable for manual or automatic transfer to bypass. The user shall be able to select via keypad programming which drive faults will generate an automatic transfer to bypass and which faults require a manual transfer to bypass.
10. There shall be an adjustable motor current sensing circuit for the bypass and VFD mode to provide proof of flow indication. The condition shall be indicated on the keypad display, transmitted over the building automation protocol and on a relay output contact closure.
11. The bypass controller shall have six programmable digital inputs, and five programmable Form-C relay outputs.
12. The relay outputs from the bypass shall be programmable for any of the following indications.
  - a. System started
  - b. System running
  - c. Bypass override enabled
  - d. Drive fault
  - e. Bypass fault
  - f. Bypass H-O-A position
  - g. Motor proof of flow (broken belt)
  - h. Overload
  - i. Bypass selected
  - j. Bypass run
  - k. System started (damper opening)
  - l. Bypass alarm
  - m. Over temperature
13. The digital inputs for the system shall accept 24VAC or 24VDC. The bypass shall incorporate internally sourced power supply and not require an external control power source. The bypass power board shall supply 250 ma of 24 VDC for use by others to power external devices.

14. Customer Interlock Terminal Strip – provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in VFD or Bypass mode. The remote start/stop contact shall operate in VFD and bypass modes. The terminal strip shall allow for independent connection of up to four (4) unique safety inputs.
15. The user shall be able to select the text to be displayed on the keypad when the safety opens. Example text display indications include “Firestat”, “Freezestat”, “Over pressure” and “Low pressure”. The user shall also be able to determine which of the four (4) safety contacts is open over the serial communications connection.
16. Class 10, 20, or 30 (selectable) electronic motor overload protection shall be included.

### PART 3 – EXECUTION

#### 3.1 INSTALLATION

- A. Installation shall be the responsibility of the mechanical contractor. The contractor shall install the drive in accordance with the requirements of the VFD manufacturer’s installation manual.

#### 3.2 START-UP

- A. Certified factory start-up shall be provided for each drive by a factory certified service center. A certified start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

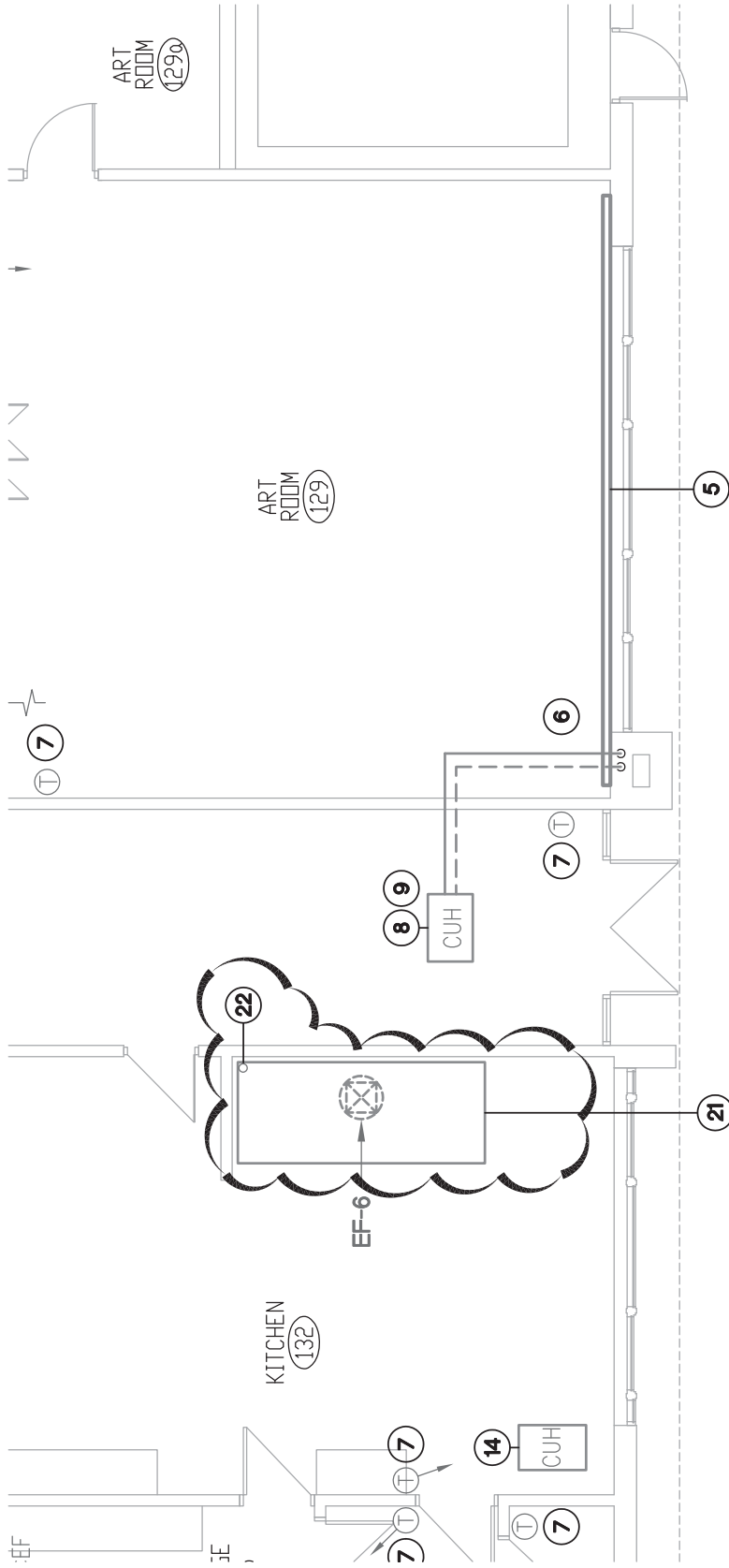
#### 3.3 PRODUCT SUPPORT

- A. Factory trained application engineering and service personnel that are thoroughly familiar with the VFD products offered shall be locally available at both the specifying and installation locations. A toll free 24/365 technical support line shall be available.
- B. A computer based training CD or 8-hour professionally generated video (VCR format) shall be provided to the owner at the time of project closeout. The training shall include installation, programming and operation of the VFD, bypass and serial communication.

#### 3.4 WARRANTY

- A. Warranty shall be 24 months from the date of certified start-up, not to exceed 30 months from the date of shipment. The warranty shall include all parts, labor, travel time and expenses.

END OF SECTION 15900



- MECHANICAL DEMOLITION WORK SYMBOLS -

(20) EXISTING THROUGH THE WALL AIR CONDITIONING UNIT SHALL REMAIN.

(21) REMOVE EXISTING KITCHEN EXHAUST FAN ON ROOF, ROOF CURB, KITCHEN EXHAUST HOOD, AND ANSUL SYSTEM.

(22) DISCONNECT AND REMOVE EXISTING GAS PIPE THROUGH KITCHEN EXHAUST HOOD. REMOVE GAS VALVE ABOVE CEILING. CAP FOR FUTURE CONNECTION.

HOPEWELL ELEMENTARY SCHOOL  
 RENOVATIONS  
 GLASTONBURY, CONNECTICUT

KITCHEN EXHAUST DEMOLITION  
 REVISION

DATE: APRIL 11, 2012

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

DRAWN: AIL

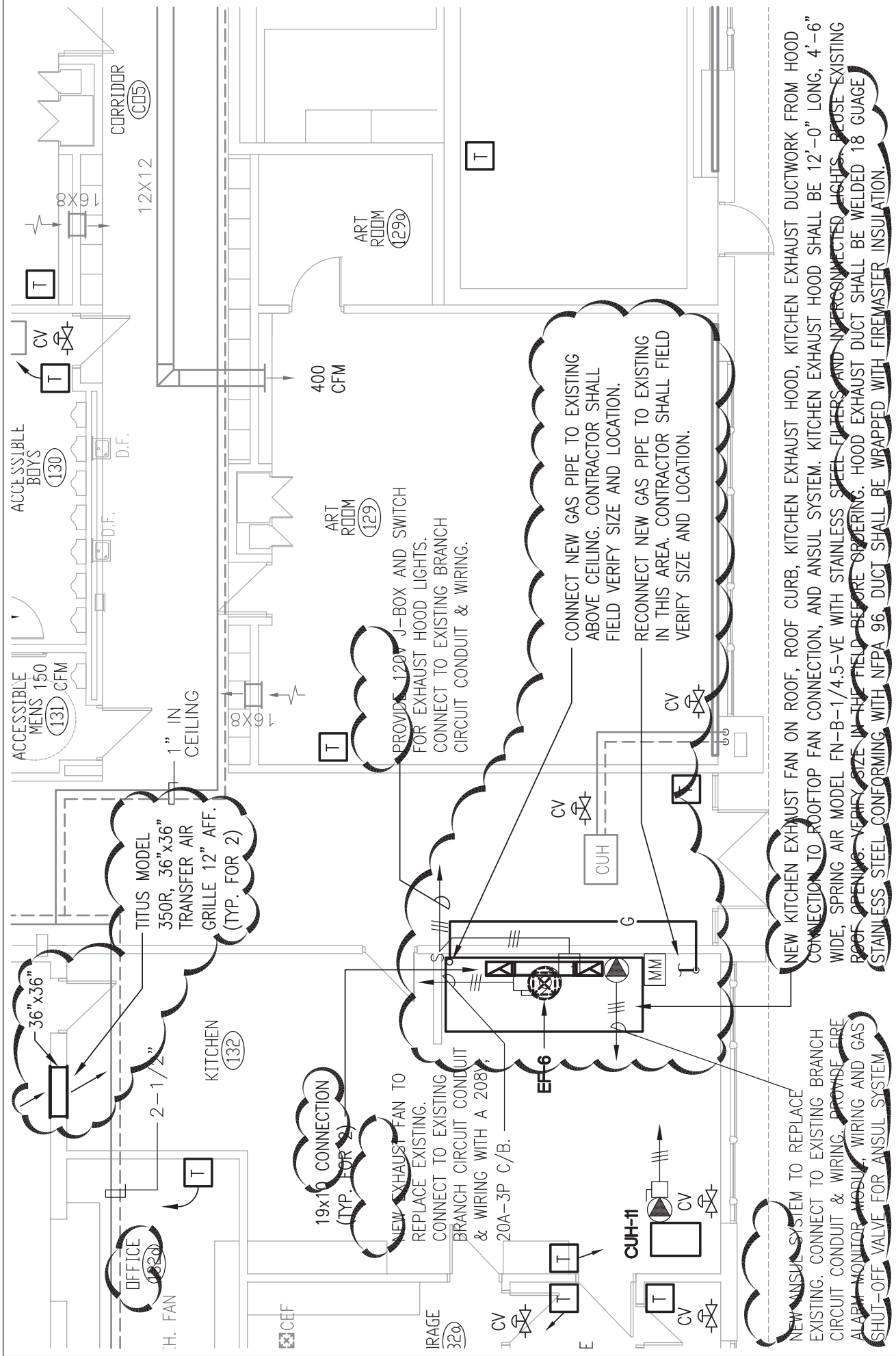
BEMIS ASSOCIATES, L.L.C.  
 Consulting Engineers

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BA

DWG. NO.

MSK-1



**HOPEWELL ELEMENTARY SCHOOL**  
 RENOVATIONS  
 GLASTONBURY, CONNECTICUT

**BEMIS ASSOCIATES, L.L.C.**  
 Consulting Engineers

DATE: APRIL 11, 2012  
 SCALE: 1/8"=1'-0"  
 DRAWN: AIL

DWG. NO. **MSK-2**

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**KITCHEN EXHAUST REVISION**

TITUS MODEL  
 350R, 36"x36"  
 TRANSFER AIR  
 GRILLE 12" AFF.  
 (TYP. FOR 2)

19x19 CONNECTION  
 (TYP. FOR 2)

NEW EXHAUST FAN TO  
 REPLACE EXISTING.  
 CONNECT TO EXISTING  
 BRANCH CIRCUIT CONDUIT  
 & WIRING WITH A 208V,  
 20A-3P C/B.

PROVIDE 120V J-BOX AND SWITCH  
 FOR EXHAUST HOOD LIGHTS.  
 CONNECT TO EXISTING BRANCH  
 CIRCUIT CONDUIT & WIRING.

CONNECT NEW GAS PIPE TO EXISTING  
 ABOVE CEILING. CONTRACTOR SHALL  
 FIELD VERIFY SIZE AND LOCATION.  
 RECONNECT NEW GAS PIPE TO EXISTING  
 IN THIS AREA. CONTRACTOR SHALL FIELD  
 VERIFY SIZE AND LOCATION.

NEW ANSUL SYSTEM TO REPLACE  
 EXISTING. CONNECT TO EXISTING BRANCH  
 CIRCUIT CONDUIT & WIRING. PROVIDE FIRE  
 ALARM MONITOR MODULE, WIRING AND GAS  
 SHUT-OFF VALVE FOR ANSUL SYSTEM.

NEW KITCHEN EXHAUST FAN ON ROOF, ROOF CURB, KITCHEN EXHAUST HOOD, KITCHEN EXHAUST DUCTWORK FROM HOOD  
 CONNECTION TO ROOFTOP FAN CONNECTION, AND ANSUL SYSTEM. KITCHEN EXHAUST HOOD SHALL BE 12'-0" LONG, 4'-6"  
 WIDE, SPRING AIR MODEL FN-B-1/4.5-VE WITH STAINLESS STEEL FILTERS AND INTERCONNECTED LIGHTS. REUSE EXISTING  
 ROOF OPENING. VERIFY SIZE IN THE FIELD BEFORE ORDERING. HOOD EXHAUST DUCT SHALL BE WELDED 18 GAUGE  
 STAINLESS STEEL CONFORMING WITH NFPA 96. DUCT SHALL BE WRAPPED WITH FIREMASTER INSULATION.





### HEATING AND VENTILATING UNIT

UNIT NO.	AREA SERVED	MANUF.	MODEL	SIZE	CFM	MIN. % OA	SP	TSP	HP	VOLTS	PH	HTG. CAP		
												COIL TYPE	MBH	GPV
HV-1	136 - MULTI-PURPOSE ROOM 136a - MUSIC PLATFORM	TRANE	PCC	12	6000	75%	0.5	1.5	5	208	3	HW	390	26

**REMARKS:**

1. SEISMICALLY SUPPORT AS REQUIRED.
2. UNIT MANUFACTURER TO PROVIDE 100% ECONOMIZER.
3. UNIT MANUFACTURER TO PROVIDE UNIT MOUNTED DISCONNECT SWITCH.

4. COOLING COIL SHALL BE INSTALLED CAPPED AND UNCHARGED FOR CONNECTION TO FUTURE OUTDOOR CONDENSING SECTION.
5. CONTRACTOR SHALL PROVIDE SECONDARY DRIP PAN.

### HEATING AND VENTILATING UNIT (CONT'D)

I	HTG. CAP (CONT'D)						CLG. CAP						REMARKS		
	WPD	EWT	LWT	EAT	LAT	APD	COIL TYPE	TMBH	SMBH	EAT (DB)	EAT (WB)	LAT (DB)		LAT (WB)	REF. TYPE
1.96	190	160	55	115	0.18		DX	240	165	80.0	67.0	55.0	54.0	R-410A	1,2,3,4,5, 6,7,8,9

6. PROVIDE LEFT HAND SIDE COIL CONNECTION AND ALL ACCESS.
7. PROVIDE OUTSIDE AIR OPENING ON REAR OF UNIT.
8. PROVIDE RETURN AIR OPENING ON BOTTOM OF UNIT.

9. AIR HANDLING UNIT SHALL BE INTERLOCKED WITH KITCHEN EXHAUST FAN EF-6. UPON ACTIVATION OF EF-6 AIR HANDLING UNIT HV-1 SHALL BE ACTIVATED.

10. TCC SHALL PROVIDE FREEZE STAT ON HOT WATER COIL.

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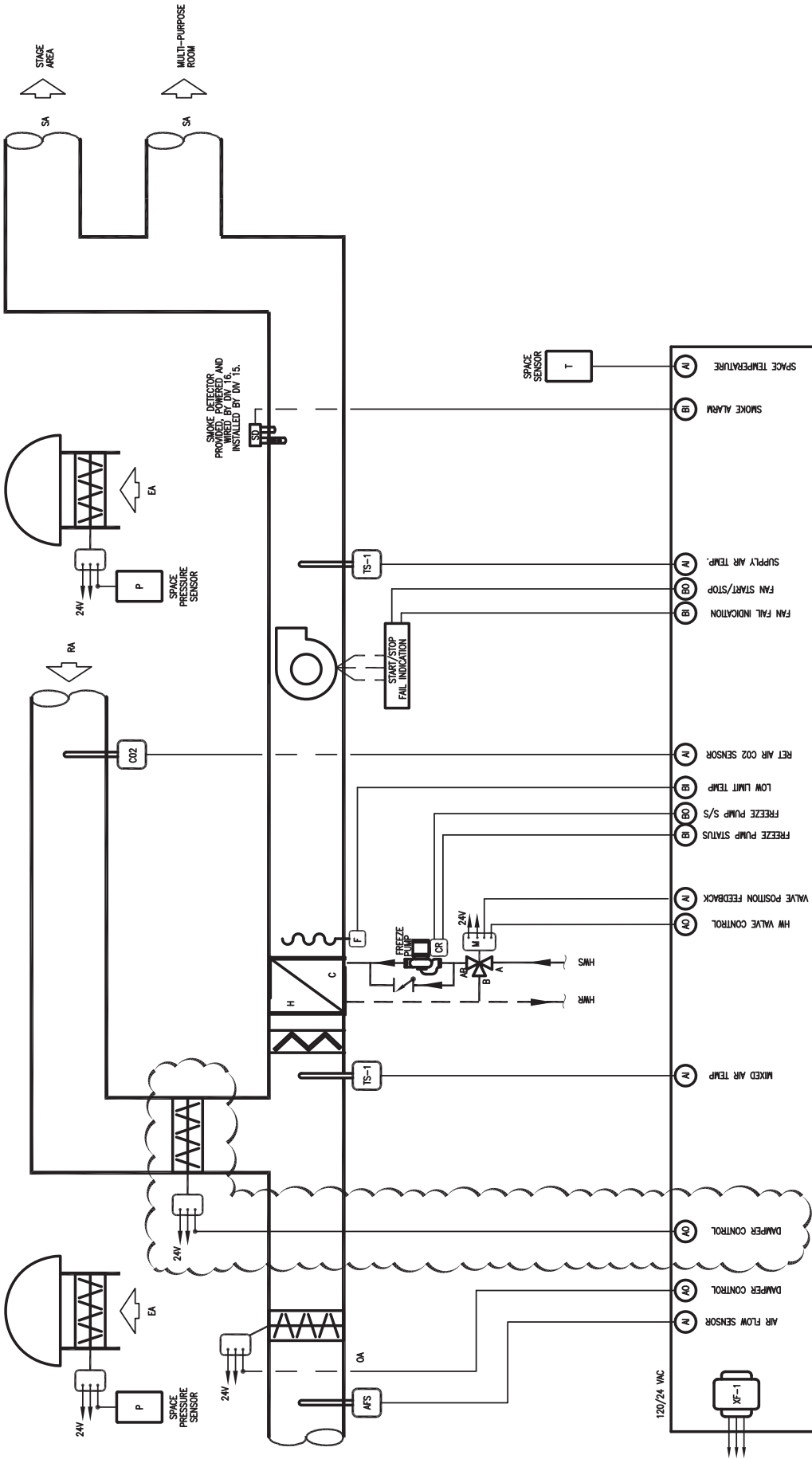
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**MSK-4**

HEATING AND VENTILATION UNIT  
 REVISION



CONSTANT AIR VOLUME SYSTEM - MULTI-PURPOSE ROOM / STAGE AREA

NO SCALE

HOPEWELL ELEMENTARY SCHOOL  
 RENOVATIONS  
 GLASTONBURY, CONNECTICUT

BEMIS ASSOCIATES, L.L.C.  
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CONTROLS DIAGRAM  
 REVISION

DATE: APRIL 11, 2012

SCALE: NO SCALE

DRAWN: AIL

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MSK-5

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