

## **HVAC DUCT AND EQUIPMENT CLEANING AND REMEDIATION**

**DOCUMENT NUMBER: 15400**

**APPLICATION: ELEMENTARY, MIDDLE AND HIGH SCHOOL**

### **DATE OF ISSUE:**

**06-07-04 - Revised 15400 1.3 I and L, added section 15401**

05-13-03 - First issued

### **NOTES:**

Ductwork cleaning and remediation is to be performed in accordance with the attached specification. Select the appropriate section from the two attached.

### **ATTACHMENTS:**

HVAC Duct and Equipment Cleaning and Remediation Specification, dated 06-07-04

HVAC Duct and Equipment Cleaning, dated 06-07-04.

## **SECTION 15400 - HVAC DUCT CLEANING AND REMEDIATION**

### **PART 1. – GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. The general conditions, mechanical requirements and all requirements of the contract documents shall apply to all work of this Division.

#### **1.2 SCOPE OF WORK**

- A. Work consists of providing all labor, equipment, materials and supervision necessary to perform the techniques specifically required for the removal of agents potentially deleterious to human health, removal of visible surface contaminants and the cleaning of air-side surfaces of all air intakes, air handlers, coils, dampers, terminal units, grilles and duct systems, as specified herein, including, but not limited to, all adjunct components in strict accordance with these specifications.
  - 1. Clean and remediate the interior of all rooftop package air conditioners.
  - 2. Clean and remediate the interior of all return air ducts and return air grilles.
- B. Work area is to include entire building, see drawings for graphical representation.

#### **1.3 QUALITY ASSURANCE**

- A. All cleaning procedures shall be accomplished by an indoor environmental company with personnel that shall have specialized knowledge and expertise in the methods required for the removal of such materials. The contractor is required to be State Licensed (Class A or Mechanical HVAC) as required by FCILB (Florida Contractors Industry License Board) Rule Chapter 489 F.S. Parts II and III. The FCILB stated that a Mechanical License is required to perform work on HVAC systems over 25 tons.
- B. Occupational Health and Safety Administration (OSHA general industry standard for respiratory protection 29 CFR 1910.134) requires that a respiratory protection program be established. In order to perform remediation, employee certification and an in-house Respiratory Protection Program (RPP) documentation must be submitted.
- C. The contractor shall assure that its employees have received the necessary training, medical surveillance programs, safety equipment, individual health protection measures, and manufacturer's product and material safety data sheets required for the work described by this Contract Document.
- D. The term antimicrobial product, used in the following specifications, refers to an antimicrobial formulation developed, tested and approved for HVAC ductwork and air handler applications. The antimicrobial shall be an EPA registered and approved, non-toxic water soluble solution with supporting efficacy and MSDS data. Application of the antimicrobial product shall be in accordance with the manufacturer's minimum millage surface application rate standards for effectiveness.
- E. The contractor must have a minimum of five years experience in commercial ductwork decontamination.

- F. The Contractor must supply documentation that the work performance has been in accordance with the specifications, specifically that the remediation techniques performed involved the proper use of HEPA vacuums suitable to the task and the application of the antimicrobial product to the air handling and duct systems resulted in an HVAC system that was cleaned satisfactorily.
- G. Documentation must be supplied indicating the contractor has successfully performed the aforementioned techniques on a minimum of one building 40,000 square feet in size or larger. This project must have been cleaned with a greater than 5000 CFM HEPA vacuum followed by an application of an antimicrobial product to the air handling and duct systems of said job.
- H. Bids shall be considered only from firms which are regularly engaged in the environmental business with emphasis on HVAC decontamination and/or ductwork remediation.
- I. The contractor shall furnish the **architect** with written documentation guaranteeing all effluents were properly disposed of in accordance with EPA, OSHA and HRS Rules and regulations.
- J. The contractor shall re-execute any work that fails to conform to the requirements of the Contract and which appears during the progress of the project and shall remedy any defects due to faulty materials or workmanship which appear within a period of one year from the date of final acceptance of the work by the School District.
- K. The contractor shall be responsible for unclogging HVAC components of the herein contracted air transport system including; coils, registers, dampers, turning vanes, etc., fouled by dust and other contaminants.
- L. The contractor shall report all damaged or deteriorating ductwork and/or air handler insulation to the **architect**.
- M. The contractor shall guarantee supervised night work: A "Progress Report" is to be verbally delivered to the Construction Manager within 12 hours of daily work completion.
- N. The contractor shall exercise care to prevent damage to client's equipment (including electrical motors and ceiling tiles) from water and/or chemicals used in the cleaning process. All interior equipment (including furniture and files) shall be covered and protected to prevent damage. Any damaged fixtures, equipment or systems shall be repaired if possible or replaced with equal equipment at no expense to the owner. All surface water shall be removed from air transport components and the air handling system before restarting the systems.
- O. Contractor is to issue warranty on workmanship and material for a period of one year from the time of completion of subject contract work. The warranty shall be callable if visible microbial contamination is detectable and/or if indoor levels or microbial contamination are greater than 33% of outdoor levels and outdoor levels are greater than 250 CFU per cubic meter.
- P. Contractor shall return to a normal operational state all air handling equipment that is affected by the contractor's work prior to completing work on a daily basis.

- Q. Contractor shall utilize cover material such as roll plastic and tarps as necessary to completely protect all furniture, stack and floor areas from falling dust debris. All areas affected by the work shall be thoroughly cleaned and returned to their original state at the conclusion of each work day.

#### 1.4 GLOSSARY

- A. Air Conveyance, System (ACS): is any interior surface of a building's air distribution system for conditioned spaces and or occupied zones. This includes the entire air moving system from the point that the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts (except for ceiling plenums) to the air handling unit (AHU 1, the interior surface of the AHU, mixing box, coil compartment, condensate drain pans, humidifiers, supply air ducts, fans, fan housings, fan blades, air wash systems, spray eliminators, turning vanes, filters, filter housing, reheat coils and supply diffusers are all considered part of the ACS.
- B. Coils: Devices inside the ACS which temper and/or dehumidify the air handled by the ACS. These include heat exchangers, with or without extended surfaces, through which either water, ethylene glycol solution, brine, volatile refrigerant, or steam is circulated for the purpose of total cooling (sensible cooling plus latent cooling) or sensible heating of a forced circulation air stream.
- C. Consultant: As referred to in this document means an IAQ consulting firm and/or their designee.
- D. Contractor: As referred to in this document means the licensed entity approved to perform this work.
- E. Debris: Any solid material in the air conveyance system, including particulate substances, not intended to be present.
- F. Ductwork: A system of passageways for intake, distribution and extraction of air.
- G. Fan: A power driven machine which moves a volume of air by converting rotational mechanical energy to an increase in the total pressure of the moving air.
- H. Mechanical Cleaning: Physical removal of debris and other foreign matter from ACS surfaces.
- I. MSDS: Material Safety Data Sheet
- J. Non-Porous: Any surface of the ACS in contact with the air stream which cannot be penetrated by either solutions or air. This would exclude materials such as woods, fiberboard, thermal insulation and concrete.
- K. Visibly Clean: A visible inspection determination that portions or components are both:
1. Free of debris, and
  2. In the School Districts judgment, or that of their representative, capable of verification using dust vacuum sampling protocol.
- L. Work: When used in this document means all activities related to the accomplishing of the work efforts as needed to complete all items of this specification.

## **PART 2. – PRODUCTS**

### **2.1 IAQ/HVAC REMEDIATION EQUIPMENT**

- A. Indoor portable, HEPA filtered negative vacuum system at 4,000 to 6,000 CFM. EPA filtered vacuum shall be fitted with minihelic, "Inches of water gauge", to insure proper negative pressure is maintained, thus preventing escape of debris removed during the cleaning process into the inhabited area.
- B. Vacuum systems shall be HEPA filtered and designed with an airtight "safety lined" cabinet.
- C. Efficiency of HEPA vacuum filtration is to meet a minimum of 99.97% at 0.3 microns.
- D. Must maintain 0.8" of water gauge pressure as measured by the minihelic gauge on the HEPA Vacuum.
- E. Duct brushes may vary in size from 8" to 128" and be designed of light nylon bristles.
- F. Portable air compressor is to be rated at 150 to 200 PSI and 15 to 17 CFM.
- G. Pressure washer is to be rated at 800-1500 psig.

### **2.2 DUCT ACCESS DOORS / PORT OPENINGS**

- A. The contractor shall furnish and install access openings into the ducts at various points of the duct system for physical and mechanical entry as required for proper cleaning. The openings shall be provided at various points and adjacent to the in-line components, i.e. turning vanes, dampers, etc., that tend to entrap contaminants.
- B. When already installed in the HVAC system, the contractor shall utilize the existing access openings for remediation where possible.
- C. The access openings shall be eighteen (18) gauge metal with 1/2 inch Armaflex insulation on the inside. Door edges shall be twice turned in 1/2" over the insulation.
- D. The access openings shall have a hand-type latch designed to tightly secure them and prevent air leakage yet permit re-access at future times.

## **PART 3. – EXECUTION**

### **3.1 AIR HANDLER REMEDIATION**

- A. The contractor shall ensure the supply and return fans of blowers relating to air handler zones of influence are thoroughly cleaned. Areas cleaned shall include; blowers, fan housings, blades, vanes, shafts, baffles and drive assemblies.
- B. Any surface with contamination deposits shall be cleaned in the manner previously outlined.

- C. Any components or items within the air handler units that could possibly be subject to damage by the cleaning process shall be properly protected during the cleaning process, as applicable.
- D. The interior insulation shall be cleaned with a vacuum. The cleaning procedures shall be accompanied by the use of specialized equipment, i.e., high efficiency vacuum system utilizing HEPA filters, high pressure washers, duct brushes, etc. as required by equipment specifications. Special attention shall be taken while cleaning to prevent high levels of microbial contaminants from becoming airborne and disseminated into occupied areas. All effluents shall be removed and legally disposed of by the contractor. The contractor shall, during decontamination, maintain certified respirators, safety glasses and clothing according to the OSHA respiratory protection standard 29-CFR-1910.134. Coat all fiberglass surfaces with Fosters 4020.
- E. Air handler frame-work and metal surfaces, (excluding heat transfer components) shall be cleaned and sanitized with an antimicrobial product - Oxine as manufactured by Biocide International.
- F. The contractor shall remove contamination from all cooling coils. Coils shall be thoroughly cleaned on all exterior surfaces i.e., both upstream and downstream. In the interior coil bank all contamination shall be removed permitting air flow and heat transfer. Coils shall be thoroughly rinsed to remove latent residues.
- G. Coils may be cleaned with nontoxic, non-acid cleaner if properly rinsed and flushed after cleaning.
- H. Drain pans shall be treated with Pan Guard as manufactured by Controls Release Technologies. This treatment shall conform strictly to the manufacturer's written instructions.
- I. All sanitizing and coating products shall be registered with the EPA for use in each application. Registration of components of the product is not sufficient. The product must be must have its own registration as a blend of its components.
- J. The relative humidity of the indoor environment shall be maintained at 60% or less during the remediation process.

### 3.2 DUCT SYSTEM REMEDIATION

- A. The contractor shall clean all components of air transport system (i.e. sheet metal ducts, rigid fiberglass ductboard, ductwork liner, flex duct, etc.). Cleaning will properly remove lint, hair, fungi, dirt and other foreign materials and residues.
- B. The cleaning procedures shall be accompanied by the use of specialized equipment, i.e., high efficiency vacuum system utilizing HEPA filters, high pressure washers, duct brushes, etc. as required by equipment specifications.
- C. Special attention shall be taken while cleaning to prevent high levels of microbial contaminants from becoming airborne and disseminated into occupied areas. All effluents shall be removed and legally disposed of by the contractor.
- D. The contractor shall, during decontamination, maintain certified respirators, safety glasses and clothing according to the OSHA respiratory protection standard 29-CFR-1910.134.

- E. The contractor shall be responsible for unclogging and thoroughly cleaning HVAC duct system components including; return registers, dampers, turning vanes, etc., fouled by dust and other contaminants.
- F. The contractor shall ensure that all damper and splitter dampers are marked to identify the original position before commencing work. All components will be returned to their original setting upon completion of the cleaning process.
- G. Manually operating dampers shall be firmly reset in their original position after cleaning.
- H. Dampers in need of repair or replacement shall be brought to the attention of the architect.
- I. Return air ducts are to be cleaned and decontaminated if ducted returns are used in the subject HVAC systems. Open plenums above ceilings and utility chases used for return air purposes shall not be cleaned unless requested and handled as an additional work order.
- J. The contractor shall remove and wash all return air grilles with a nontoxic, disinfecting solution.
- K. Prior to reinstalling terminals they shall be treated with a long term antimicrobial product.
- L. All sanitizing and coating products shall be registered with the EPA for use in each application. Registration of components of the product is not sufficient. The product must be must have its own registration as a blend of its components.
- M. The relative humidity of the indoor environment shall be maintained at 60% or less during the remediation process.

### 3.3 ANTIMICROBIAL TREATMENT

- A. Once modifications and cleaning have been accomplished, the contractor shall apply an EPA registered antimicrobial application designed specifically for HVAC ducts to all air side surfaces of air handlers and return air duct systems.
- B. The antimicrobial product shall be sprayed directly onto the air side surface of the ductwork system. It shall not be sprayed from a distance of more than 30 inches. Fumes resulting from the antimicrobial treatment shall be contained within the enclosed system using a negative pressure of approximately 0.8" WATER GAUGE (WG) within the ductwork being painted. All fumes shall be exhausted to the outside of the building.
- C. Any overspray shall be removed by the contractor.
- D. All sanitizing and coating products shall be registered with the EPA for use in each application. Registration of components of the product is not sufficient. The product must be must have its own registration as a blend of its components.
- E. The relative humidity of the indoor environment shall be maintained at 60% or less during the remediation process.

### 3.4 TOPICAL TREATMENT WITH BOUND DISINFECTANT

- A. The areas with visual microbial contamination shall be under a negative pressurization HEPA filtration vacuum at 2000 CFM and 99.97% efficiency to 0.3 microns.
- B. All effluents removed from areas to be cleaned shall be bagged and removed.
- C. (OSHA) Health and Safety Compliance Program will be adhered to:
  - 1. OSHA Respiratory Protection Program (OSHA 29 C.F.R. \* 1910.134).
  - 2. OSHA Hazard Program \* 1910.146.
  - 3. OSHA Lock Out/Tag Out \* 1910.101.
- D. Visible areas of mold contamination are to be hand vacuumed and cleaned using a portable HEPA vacuum with 99.97% efficiency at 0.3m. Following vacuuming, spray 10% sodium hypochlorite spray.
- E. Spray 10% sodium hypochlorite disinfectant onto previously visibly contaminated surfaces. Wipe, carefully, with cloth or paper toweling. If paper toweling is to be used, a plastic bag for trash must be available. To remove bag from area (when job is finished) place the filled bag into a separate bag with goose neck for transfer to trash dumpster. This represents double-bagging protocol.
- F. Once the surface has been wiped down, apply M-1 containing bound disinfectant and permit to air dry. If "run marks" are noted, wipe down with a dry towel and place towel in trash.
- G. Make certain all surfaces have been cleaned and equipment removed from the room using protocols above, returning room to normal arrangements.
- H. All sanitizing and coating products shall be registered with the EPA for use in each application. Registration of components of the product is not sufficient. The product must be must have its own registration as a blend of its components.
- I. The relative humidity of the indoor environment shall be maintained at 60% or less during the remediation process.

### 3.5 AIR HANDLER INSULATION REPLACEMENT

Remove and clean all exposed degraded insulation in air handlers only. Replace with Armaflex (or approved equal) 1-inch nominal wall insulation to conform with ASTM E-84 test. Such material shall be in conformance with maximum 25 foot flame-spread and maximum 50 foot smoke development.

### 3.6 REPORTING

- A. Daily verbal reports shall be made to the Construction Manager. The report shall contain information on what was completed the night prior and what will be completed the night following the report. In the event the Construction Manager is not available to receive the verbal report, a written report will be forwarded to him.
- B. A final report will be submitted to the Construction Manager at the conclusion of the work. The report shall contain accounts of the work that was done and before and after photographs of all areas that were remedied.

END OF SECTION 15400



## **SECTION 15401 - HVAC DUCT AND EQUIPMENT CLEANING**

### **PART 4. – GENERAL**

#### **4.02 RELATED DOCUMENTS**

- A. The general conditions, mechanical requirements and all requirements of the contract documents shall apply to all work of this Division.

#### **1.2 SCOPE OF WORK**

- A. Work consists of providing all labor, equipment, materials and supervision necessary to perform the techniques specifically required for the cleaning of air-side surfaces of all air intakes, air handlers, coils, dampers, terminal units, grilles and duct systems, as specified herein, including, but not limited to, all adjunct components in strict accordance with these specifications.
  - 1. Clean the interior of all rooftop package air conditioners.
  - 2. Clean the interior of all return air ducts and return air grilles.
- B. Work area is to include entire building, see drawings for graphical representation.

#### **1.3 QUALITY ASSURANCE**

- A. All cleaning procedures shall be accomplished by an indoor environmental company with personnel that shall have specialized knowledge and expertise in the methods required for the removal of such materials. The contractor is required to be State Licensed (Class A or Mechanical HVAC) as required by FCILB (Florida Contractors Industry License Board) Rule Chapter 489 F.S. Parts II and III. The FCILB stated that a Mechanical License is required to perform work on HVAC systems over 25 tons.
- B. Occupational Health and Safety Administration (OSHA general industry standard for respiratory protection 29 CFR 1910.134) requires that a respiratory protection program be established. In order to perform remediation, employee certification and an in-house Respiratory Protection Program (RPP) documentation must be submitted.
- C. The contractor shall assure that its employees have received the necessary training, medical surveillance programs, safety equipment, individual health protection measures, and manufacturer's product and material safety data sheets required for the work described by this Contract Document.
- D. The contractor must have a minimum of five years experience in commercial ductwork decontamination.
- E. The Contractor must supply documentation that the work performance has been in accordance with the specifications, specifically that the remediation techniques performed involved the proper use of HEPA vacuums suitable to the task and the air handling and duct systems resulted in an HVAC system that was cleaned satisfactorily.
- F. Documentation must be supplied indicating the contractor has successfully performed the aforementioned techniques on a minimum of one building 40,000 square feet in size or larger. This project must have been cleaned with a greater than 5000 CFM HEPA vacuum to the air handling and duct systems of said job.

- G. Bids shall be considered only from firms which are regularly engaged in the environmental business with emphasis on HVAC ductwork cleaning.
- H. The contractor shall re-execute any work that fails to conform to the requirements of the Contract and which appears during the progress of the project and shall remedy any defects due to faulty materials or workmanship which appear within a period of one year from the date of final acceptance of the work by the School District.
- I. The contractor shall be responsible for unclogging HVAC components of the herein contracted air transport system including; coils, registers, dampers, turning vanes, etc., fouled by dust and other contaminants.
- J. The contractor shall report all damaged or deteriorating ductwork and/or air handler insulation to the architect.
- K. The contractor shall guarantee supervised night work: A "Progress Report" is to be verbally delivered to the Construction Manager within 12 hours of daily work completion.
- L. The contractor shall exercise care to prevent damage to client's equipment (including electrical motors and ceiling tiles) from water used in the cleaning process. All interior equipment (including furniture and files) shall be covered and protected to prevent damage. Any damaged fixtures, equipment or systems shall be repaired if possible or replaced with equal equipment at no expense to the owner. All surface water shall be removed from air transport components and the air handling system before restarting the systems.
- M. Contractor is to issue warranty on workmanship and material for a period of one year from the time of completion of subject contract work.
- N. Contractor shall return to a normal operational state all air handling equipment that is affected by the contractors work prior to completing work on a daily basis.
- O. Contractor shall utilize cover material such as roll plastic and tarps as necessary to completely protect all furniture, stack and floor areas from falling dust debris. All areas affected by the work shall be thoroughly cleaned and returned to their original state at the conclusion of each work day.

#### 1.4 GLOSSARY

- A. Air Conveyance, System (ACS): is any interior surface of a building's air distribution system for conditioned spaces and or occupied zones. This includes the entire air moving system from the point that the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts (except for ceiling plenums) to the air handling unit (AHU 1, the interior surface of the AHU, mixing box, coil compartment, condensate drain pans, humidifiers, supply air ducts, fans, fan housings, fan blades, air wash systems, spray eliminators, turning vanes, filters, filter housing, reheat coils and supply diffusers are all considered part of the ACS.
- B. Coils: Devices inside the ACS which temper and/or dehumidify the air handled by the ACS. These include heat exchangers, with or without extended surfaces, through which either water, ethylene glycol solution, brine, volatile refrigerant, or steam is circulated for the purpose of total cooling (sensible cooling plus latent cooling) or sensible heating of a forced circulation air stream.

- C. Consultant: As referred to in this document means an IAQ consulting firm and/or their designee.
- D. Contractor: As referred to in this document means the licensed entity approved to perform this work.
- E. Debris: Any solid material in the air conveyance system, including particulate substances, not intended to be present.
- F. Ductwork: A system of passageways for intake, distribution and extraction of air.
- G. Fan: A power driven machine which moves a volume of air by converting rotational mechanical energy to an increase in the total pressure of the moving air.
- H. Mechanical Cleaning: Physical removal of debris and other foreign matter from ACS surfaces.
- I. MSDS: Material Safety Data Sheet
- J. Non-Porous: Any surface of the ACS in contact with the air stream which cannot be penetrated by either solutions or air. This would exclude materials such as woods, fiberboard, thermal insulation and concrete.
- K. Visibly Clean: A visible inspection determination that portions or components are both:
  1. Free of debris, and
  2. In the School Districts judgment, or that of their representative, capable of verification using dust vacuum sampling protocol.
- L. Work: When used in this document means all activities related to the accomplishing of the work efforts as needed to complete all items of this specification.

## **PART 5. – PRODUCTS**

### **2.1 IAQ/HVAC CLEANING EQUIPMENT**

- H. Indoor portable, HEPA filtered negative vacuum system at 4,000 to 6,000 CFM. EPA filtered vacuum shall be fitted with minihelic, "Inches of water gauge", to insure proper negative pressure is maintained, thus preventing escape of debris removed during the cleaning process into the inhabited area.
- I. Vacuum systems shall be HEPA filtered and designed with an airtight "safety lined" cabinet.
- J. Efficiency of HEPA vacuum filtration is to meet a minimum of 99.97% at 0.3 microns.
- K. Must maintain 0.8" of water gauge pressure as measured by the minihelic gauge on the HEPA Vacuum.
- L. Duct brushes may vary in size from 8" to 128" and be designed of light nylon bristles.
- M. Portable air compressor is to be rated at 150 to 200 PSI and 15 to 17 CFM.
- N. Pressure washer is to be rated at 800-1500 psig.

## 2.2 DUCT ACCESS DOORS / PORT OPENINGS

- E. The contractor shall furnish and install access openings into the ducts at various points of the duct system for physical and mechanical entry as required for proper cleaning. The openings shall be provided at various points and adjacent to the in-line components, i.e. turning vanes, dampers, etc., that tend to entrap contaminants.
- F. When already installed in the HVAC system, the contractor shall utilize the existing access openings for remediation where possible.
- G. The access openings shall be eighteen (18) gauge metal with 1/2 inch Armaflex insulation on the inside. Door edges shall be twice turned in 1/2" over the insulation.
- H. The access openings shall have a hand-type latch designed to tightly secure them and prevent air leakage yet permit re-access at future times.

## **PART 6. – EXECUTION**

### 3.1 AIR HANDLER CLEANING

- A. The contractor shall ensure the supply and return fans of blowers relating to air handler zones of influence are thoroughly cleaned. Areas cleaned shall include; blowers, fan housings, blades, vanes, shafts, baffles and drive assemblies.
- B. Any surface with contamination deposits shall be cleaned in the manner previously outlined.
- C. Any components or items within the air handler units that could possibly be subject to damage by the cleaning process shall be properly protected during the cleaning process, as applicable.
- D. The interior insulation shall be cleaned with a vacuum. The cleaning procedures shall be accompanied by the use of specialized equipment, i.e., high efficiency vacuum system utilizing HEPA filters, high pressure washers, duct brushes, etc. as required by equipment specifications. The contractor shall maintain certified respirators, safety glasses and clothing according to the OSHA respiratory protection standard 29-CFR-1910.134. Coat all fiberglass surfaces with white latex paint.
- E. Air handler frame-work and metal surfaces, (excluding heat transfer components) shall be cleaned.
- F. The contractor shall remove dirt from all cooling coils. Coils shall be thoroughly cleaned on all exterior surfaces i.e., both upstream and downstream. In the interior coil bank all dirt shall be removed permitting air flow and heat transfer. Coils shall be thoroughly rinsed to remove latent residues.
- G. Coils may be cleaned with nontoxic, non-acid cleaner if properly rinsed and flushed after cleaning.
- H. Drain pans shall be treated with Pan Guard as manufactured by Controls Release Technologies. This treatment shall conform strictly to the manufacturer's written instructions.

### 3.2 DUCT SYSTEM CLEANING

- A. The contractor shall clean all components of air transport system (i.e. sheet metal ducts, rigid fiberglass ductboard, ductwork liner, flex duct, etc.). Cleaning will properly remove lint, hair, dirt and other foreign materials and residues.
- B. The cleaning procedures shall be accompanied by the use of specialized equipment, i.e., high efficiency vacuum system utilizing HEPA filters, high pressure washers, duct brushes, etc. as required by equipment specifications.
- C. The contractor shall, during cleaning, maintain certified respirators, safety glasses and clothing according to the OSHA respiratory protection standard 29-CFR-1910.134.
- D. The contractor shall be responsible for unclogging and thoroughly cleaning HVAC duct system components including; return registers, dampers, turning vanes, etc., fouled by dust and other dirt.
- E. The contractor shall ensure that all damper and splitter dampers are marked to identify the original position before commencing work. All components will be returned to their original setting upon completion of the cleaning process.
- F. Manually operating dampers shall be firmly reset in their original position after cleaning.
- G. Dampers in need of repair or replacement shall be brought to the attention of the architect.
- H. Return air ducts are to be cleaned if ducted returns are used in the subject HVAC systems. Open plenums above ceilings and utility chases used for return air purposes shall not be cleaned unless requested and handled as an additional work order.
- I. The contractor shall remove and wash all return air grilles.

### 3.5 AIR HANDLER INSULATION REPLACEMENT

Remove and clean all exposed degraded insulation in air handlers only. Replace with Armaflex (or approved equal) 1-inch nominal wall insulation to conform with ASTM E-84 test. Such material shall be in conformance with maximum 25 foot flame-spread and maximum 50 foot smoke development.

### 3.6 REPORTING

- C. Daily verbal reports shall be made to the Construction Manager. The report shall contain information on what was completed the night prior and what will be completed the night following the report. In the event the Construction Manager is not available to receive the verbal report, a written report will be forwarded to him.
- D. A final report will be submitted to the Construction Manager at the conclusion of the work. The report shall contain accounts of the work that was done and before and after photographs of all areas that were cleaned.

END OF SECTION 15401