
IFB NO. Y17-769-TA

ISSUED: May 24, 2017

INVITATION FOR BIDS

FOR

**ORANGE COUNTY CONVENTION CENTER WEST BUILDING ROOF
REPLACEMENT**

**PART H
TECHNICAL SPECIFICATIONS**

**PART H
VOLUME II**

PROJECT MANUAL

ROOF REPLACEMENT AND DESIGNATED REPAIRS

AT THE

**ORANGE COUNTY CONVENTION CENTER: WEST BUILDING
9800 INTERNATIONAL DRIVE, ORLANDO, FL 32819**

For

**ORANGE COUNTY CONVENTION CENTER
9800 International Drive
Orlando, FL 32819**

PREPARED BY:

A/R/C ASSOCIATES, INCORPORATED
601 North Fern Creek Avenue - Suite 100
Orlando, Florida 32803
(407) 896-7875 FAX # (407) 898-6043

Date: May 8, 2017

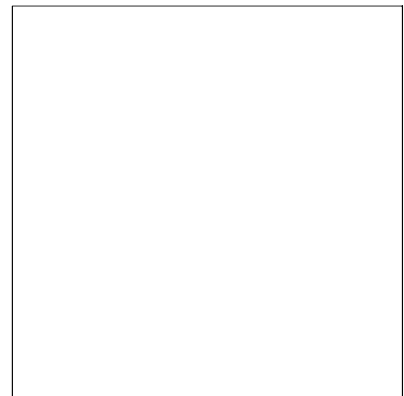


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DRAWING INDEX

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**ADMINISTRATIVE PROVISIONS
SECTION 01005**

PART I GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work of this Contract comprises the roof replacement and designated repairs for the **Orange County Convention Center West Building Roof Replacement, Orlando, Florida 32819**

1.02 CONTRACT METHOD

- A. Construct the work under a single lump sum contract (or as otherwise defined in bid documents).

1.03 COORDINATION

- A. Coordinate work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.
- B. Verify characteristics of elements of interrelated operating equipment are compatible; coordinate work of various Sections having interdependent responsibilities for installing, connecting to and placing in service, such equipment. Differences shall be brought to the Owner's attention during bid process or remain the responsibility of the Contractor.
- C. Coordinate space requirements and installation of items, such as, but not limited to, mechanical and electrical work, which are indicated diagrammatically or otherwise on drawings. Follow routing shown for pipes, ducts and conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.
- D. In finished areas (except as otherwise shown), conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.
- E. Execute cutting and patching to integrate elements of work, uncover ill timed, defective and nonconforming work, provide openings for penetrations of existing surfaces and provide samples as specified in individual sections for testing. Seal penetrations of existing surfaces and provide samples as specified in individual sections for testing. Seal penetrations through floors, walls and ceilings, and fire safe where necessary as part of the lump sum price.

1.04 FIELD ENGINEERING SURVEYING

- A. Provide field engineering surveying services; establish grades, lines and levels, by use of engineering survey practices recognized as standard by the survey industry. Said work shall be required to be provided by a Professional Land Surveyor, registered as such in

ADMINISTRATIVE PROVISIONS
SECTION 01005

the State of Florida.

- B. Control datum for survey is that shown on Grading and Drainage Plan. Locate and protect control and reference points, per requirements stated in Part F, Article 6 of the GENERAL CONDITIONS.

1.05 REFERENCE STANDARDS

- A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. The date of the standard is that in effect when a specified date is specified.
- C. Obtain copies of referenced standards listed in individual specification sections. Maintain copy at job site during progress of the specific work.

END OF SECTION

**SUMMARY OF WORK
SECTION 01010**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Project Description and Location
- B. Contractor Use of Premises
- C. Distribution of Related Documents
- D. Protection of Existing Building, Finishes, Furnishings and Equipment.
- E. Owner Occupancy and Access.
- F. Schedule
- G. Project Rain Day Form
- H. Interior Inspection Form
- I. Exterior Inspection Form
- J. Asbestos Free Material

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section

1.3 PROJECT DESCRIPTION AND LOCATION

- A. The Work of this Contract consists of roof replacement and designated repairs for the **Orange County Convention Center West Building Roof Replacement, Orlando, 9800 International Drive, FL 32819** The work will be constructed under a single lump sum contract.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 specification sections, apply to work on this contract. The Owner intends to award a single prime base bid contract, titled "General Construction Contract," for Work to be performed for this Project. The Contractor shall comply with the requirements of the General Conditions and the Supplementary Conditions in accomplishing his Work on this Project.
- C. Base Bid General Construction Contract: Includes all general trades, roofing, flashing, unit price allowances and related mechanical and electrical items specified in the Project Specifications and Work shown on the Drawings
 - 1. The Contractor's Duties include:

**SUMMARY OF WORK
SECTION 01010**

- a. Provide and pay for all labor, materials, equipment, and installation costs of items described within these documents. Provide and pay for all costs associated for all necessary tools, construction equipment, and protection of Existing Work.
 - b. The Contractor shall be responsible for the demolition and proper disposal of existing items and materials relative to this Contract
 - c. Comply with all listed and applicable Codes, Standards and Specifications.
- D. The Contractor shall be responsible for the Work as specified herein and as indicated on the Drawings. Although the majority of the Drawings are "to scale," the Contractor is directed to field verify all dimensions and assumptions used for determining material quantities and requirements. No additional monies will be allowed to the Contractor for use of "scaling instruments" to determine material quantities, lack of adequate field investigation, or for other reasons.
- E. The scope of work for this contract and the related construction is perceived to include the following:

DESCRIPTION OF WORK – OCCC West Building Roof Replacement: The scope of work is divided into seven sectors as indicated in the descriptions below. The existing roofing is to be removed and replaced as specified in the plans and details provided.

- 1. **Sector 1: Roof Areas 1/A and 1/B** (See the Roof Schedule on Sheet G01 in the project plans form more specific information by Roof Area)
 - a. *Demolition:* Remove existing single ply membrane down to existing rigid insulation. Existing fasteners may remain in place.
 - 1) Remove existing primary and secondary internal roof drains to be replaced.
 - 2) Remove existing scuppers to be replaced.
 - 3) Remove existing lightning protection system to be reinstalled.
 - b. *New Installation:* Install 2" of non-tapered rigid insulation over the existing rigid insulation followed by a 1/2" gypsum cover board and a 60 mil thermoplastic single ply membrane fastened to the metal deck below.
 - 1) Install new primary and secondary internal roof drains as specified in the mechanical drawings and specifications.
 - 2) Install new scuppers
 - 3) Install new lightning protection system as specified in the electrical drawings.
 - 4) Install new counterflashings as shown in the project details.
- 2. **Sector 2: Roof Areas 2/A and 2/B** (See the Roof Schedule on Sheet G01 in the project plans form more specific information by Roof Area)

**SUMMARY OF WORK
SECTION 01010**

- a. *Demolition:* Remove existing single ply membrane down to existing rigid insulation. Existing fasteners may remain in place.
 - 1) Remove existing primary and secondary internal roof drains to be replaced.
 - 2) Remove existing scuppers to be replaced.
 - 3) Remove existing lightning protection system to be reinstalled.

 - b. *New Installation:* Install 2" of non-tapered rigid insulation over the existing rigid insulation followed by a ½" gypsum cover board and a 60 mil thermoplastic single ply membrane fastened to the metal deck below.
 - 1) Install new primary and secondary internal roof drains as specified in the mechanical drawings and specifications.
 - 2) Install new scuppers
 - 3) Install new lightning protection system as specified in the electrical drawings.
 - 4) Install new counterflashings as shown in the project details.
- 3. Sector 3: Roof Areas 3/A thru 3/L** (See the Roof Schedule on Sheet G01 in the project plans form more specific information by Roof Area)
- a. *Demolition:* Remove existing modified bitumen cap sheet and interplies, ½" cover board, and single ply membrane beneath down to existing rigid insulation over metal deck beneath. Existing fasteners may remain in place.
 - 1) Remove existing primary and secondary internal roof drains to be replaced.
 - 2) Remove existing scuppers to be replaced.
 - 3) Remove existing counterflashings and coping where shown in the plans and details provided.
 - 4) Remove existing lightning protection system to be reinstalled.

 - b. *New Installation:* Install 2" of non-tapered rigid insulation over the existing rigid insulation followed by a ½" gypsum cover board and a 60 mil thermoplastic single ply membrane fastened to the metal deck below.
 - 1) Install new primary and secondary internal roof drains as specified in the mechanical drawings and specifications.
 - 2) Install new scuppers
 - 3) Install new lightning protection system as specified in the electrical drawings.
 - 4) Install new counterflashings as shown in the project details.
- 4. Sector 4: Roof Areas 4/A thru 4/K** (See the Roof Schedule on Sheet G01 in the project plans form more specific information by Roof Area)

**SUMMARY OF WORK
SECTION 01010**

- a. *Demolition:* Remove existing granular surfaced foam coating and modified bitumen or single ply roofing beneath down to the existing lightweight insulating concrete deck below.
 - 1) Remove existing primary and secondary internal roof drains to be replaced.
 - 2) Remove existing counterflashings and coping where shown in the plans and details provided.
 - 3) Remove existing lightning protection system to be reinstalled.
 - 4) Remove control boxes from concrete parapet interiors along with associated conduit for cove lighting.

- b. *New Installation:* Fasten a venting base sheet to the existing lightweight concrete deck, then adhere 3" of non-tapered rigid insulation followed by an adhered 1/2" gypsum cover board and an adhered 60 mil thermoplastic single ply membrane.
 - 1) Install new primary and secondary internal roof drains as specified in the mechanical drawings and specifications.
 - 2) Install new scuppers
 - 3) Install new lightning protection system as specified in the electrical drawings.
 - 4) Install new counterflashings as shown in the project details.

5. Sector 5: Roof Areas 5/A thru 5/U (See the Roof Schedule on Sheet G01 in the project plans form more specific information by Roof Area)

- a. *Demolition:* Remove existing modified bitumen cap sheet and interplies, 1/2" cover board, and single ply membrane beneath down to existing rigid insulation over metal deck beneath. Existing fasteners may remain in place.
 - 1) Remove existing primary and secondary internal roof drains to be replaced.
 - 2) Remove existing scuppers to be replaced.
 - 3) Remove existing counterflashings and coping where shown in the plans and details provided.
 - 4) Remove existing lightning protection system to be reinstalled.
 - 5) Remove control boxes from concrete parapet interiors along with associated conduit for cove lighting.

- b. *New Installation:* Install 2" of non-tapered rigid insulation over the existing rigid insulation followed by a 1/2" gypsum cover board and a 60 mil thermoplastic single ply membrane fastened to the metal deck below.
 - 1) Install new primary and secondary internal roof drains as specified in the mechanical drawings and specifications.
 - 2) Install new scuppers.

**SUMMARY OF WORK
SECTION 01010**

- 3) Install new lightning protection system as specified in the electrical drawings.
 - 4) Install new counterflashings as shown in the project details.
- 6. Sector 6: Roof Areas 6/A thru 6/E** (See the Roof Schedule on Sheet G01 in the project plans form more specific information by Roof Area)
- a. *Demolition:* Remove existing granular surfaced foam coating, single ply roofing and tapered rigid insulation down to the existing metal deck below.
 - 1) Remove existing primary and secondary internal roof drains to be replaced.
 - 2) Remove existing counterflashings and coping where shown in the plans and details provided.
 - 3) Remove control boxes from concrete parapet interiors along with associated conduit for cove lighting.
 - 4) Remove existing skylights leaving existing curb in place.
 - b. *New Installation:* Install new tapered rigid insulation as shown in the plans and attach 1/2" gypsum cover board and a 60 mil thermoplastic single ply membrane system fastened to the metal deck below.
 - 1) Install new primary and secondary internal roof drains as specified in the mechanical drawings and specifications.
 - 2) Install new counterflashings as shown in the project details.
 - 3) Install new skylights as shown in the project details.
- 7. Sector 7: Roof Areas 7/A and 7/B** (See the Roof Schedule on Sheet G01 in the project plans form more specific information by Roof Area)
- a. *Demolition:* Remove existing built up roof system down to the existing lightweight insulating concrete deck.
 - 1) Remove existing primary internal roof drains to be replaced.
 - 2) Remove existing scuppers to be replaced.
 - 3) Remove existing counterflashings where shown in the plans and details provided.
 - b. *New Installation:* Fasten a venting base sheet to the existing lightweight concrete deck, then adhere 1 1/2" of non-tapered rigid insulation followed by an adhered 1/2" gypsum cover board and an adhered 60 mil thermoplastic single ply membrane.
 - 1) Install new primary internal roof drains as specified in the mechanical drawings and specifications.
 - 2) Install new scuppers
 - 3) Install new lightning protection system as specified in the electrical drawings.
 - 4) Install new counterflashings as shown in the project details.

8. Additional Lump Sum items:

- a. Base bid shall include an allowance of ten thousand dollars (\$10,000.00) for approved damaged electrical circuit repairs required during construction. The repairs shall be to restore lighting or electrical service interrupted by the construction activity. As part of this requirement, the contractor shall not drill through or fasten to the metal roof deck one (1) work day prior to show activity. An electrician employed by the contractor shall be on site full time one day prior to show activity.

1.4 CONTRACTOR USE OF SITE AND PREMISES

- A. General: During the construction period, the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises is limited to the hours between 10:00PM and 6:00AM seven days per week or as modified by the Owner because of show operations and/or by the Owner's right to perform construction operations with its own forces or to employ separate contractors on portions of the project.
- B. General: Limited use of the premises to construction activities in areas indicated within the limit of the premises. The Contractor may use areas as indicated on the plans for storage or work areas or any legal purpose.
 - 1. Confine operations to areas within Contract limits indicated on the Drawings. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
 - 2. Keep driveways and entrances serving the premises clear and available to the Owner and the Owners' employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site
 - 3. Burial of Waste Materials: Do not dispose of organic and hazardous material on site, either by burial or by burning.
- C. Access to Site: Limited to agreed-upon staging areas and access routes.
- D. Emergency Building Exits During Construction: Maintain at all times.
- E. Time Restrictions for Performing Interior Work: To be coordinated with Owner as required.
- F. Utility Outages and Shutdown: Allowed only upon coordination with and notification of the Owner.
- G. Be responsible for items of work and material stored on premise.

1.5 DISTRIBUTION OF RELATED DOCUMENTS

**SUMMARY OF WORK
SECTION 01010**

- A. The Contractor is solely responsible for the distribution of ALL related documents/drawings to ALL appropriate vendors/subcontractors to ensure proper coordination of all aspects of the project and its related parts during bidding and construction.

1.6 PROTECTION OF EXISTING BUILDING, FINISHES, FURNISHINGS AND EQUIPMENT

- A. Comply with all requirements of Section Division 1 of these specifications in regards to protection and cleaning of the existing site, building, finishes, furnishings and equipment.
- B. Prior to construction beginning at any interior location, the contractor shall coordinate with the owner regarding sensitive areas that will require security clearance due to the nature of the buildings function.
- C. It is the contractor's responsibility to protect the existing construction and finishes from water intrusion during the course of this project.
- D. The contractor shall police and clean the interior and exterior areas of work of this project and discard all debris in the appropriate contractor provided waste receptacle / "dumpster" at the end of each work day. Comply with Division 1 of these specifications fully.

1.7 OWNER OCCUPANCY AND ACCESS

- A. The Owner will occupy the premises during the entire period of construction. Allow for the conduct of normal operations.
- B. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
- C. Schedule the Work to accommodate this requirement.
- D. Comply with established Owner Policies.
- E. Maintain "Good Housekeeping" on site as directed by Owner and Architect.
- F. Access for ongoing inspections to the premises and work underway by the Owner and Architect shall not be restricted.

1.8 SCHEDULE

- A. A progress schedule shall be made to include:
 - 1. A start date.
 - 2. A reasonable progression of work by Sector, Roof Area, and Task
 - 3. A start and finish date for construction materials and components listed in Divisions 2 thru 16 as defined by Division 1 of these specifications.

**SUMMARY OF WORK
SECTION 01010**

1.9 PROJECT RAIN DAY FORM

- A. Maintain on a daily basis and submit with each Application for Payment, the Project Rain Day Form attached at the end of this section. Project Rain Day Form shall be signed by the Owner's Representative or Architect daily. See article 8.3 of the General Conditions for additional information regarding how delays due to weather are addressed.

1.10 INTERIOR INSPECTION FORM

- A. Prior to commencing work, the Contractor will schedule a meeting with the Owner's Representative or Architect, to inspect and document the condition of the building interior(s) in both written and digital video or photographic form. Log conditions of ceiling tiles, lights, walls and flooring materials using the Interior Inspection Form attached at the end of this Section. Submit two copies of the digital files and the form signed by the Contractor and Owner's Representative to the Architect prior to the start of construction.

1.11 EXTERIOR INSPECTION FORM

- A. Prior to commencing work, the Contractor will schedule a meeting with the Owner's Representative or Architect, to inspect and document the condition of the building exterior conditions in both written and digital video or photographic form. Log conditions of exterior walls, building attachments, sidewalks, miscellaneous paving and landscaping using the Exterior Inspection Form attached at the end of this Section. Submit two copies of the digital files and the form signed by the Contractor and Owner's Representative to the Architect prior to the start of construction.

PART 2 PRODUCTS

2.01 ASBESTOS FREE MATERIAL

- A. Contractor shall provide a written and notarized statement on company letterhead(s) to certify and warrant that ONLY ASBESTOS FREE MATERIALS AND PRODUCTS were provided as required by the Architect in Section 01400, QUALITY CONTROL. Such statement shall be submitted with the final payment request. Final payment shall not be made until such statement is submitted. Contractor agrees that if materials containing asbestos are subsequently discovered at any future time to have been included in the construction, the Contractor shall be liable for all costs related to the redesign or modification of the construction of the project so that materials containing asbestos are removed from the facility. If construction has begun or has been completed pursuant to a design that includes asbestos containing materials, the Contractor shall also be liable for all costs related to the abatement of such asbestos.

PART 3 PRODUCTS (Not Used)

**SUMMARY OF WORK
SECTION 01010**

END OF SECTION

PROJECT RAIN DAY FORM

Month: _____

Project Name: _____

Project No: _____

Contractor: _____

Owner's Authorized Rep.: _____

DAY	MORNING COND./TIME	AFTERNOON COND./TIME	SUPERINTENDENT SIGNATURE	AUTH. OWNER'S REP. SIGNATURE
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PAYMENT APPLICATION PROCEDURES
SECTION 01027

PART I GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.
- B. The Contractor's Construction Schedule and Submittal Schedule are included in Section 01300 – SUBMITTALS

1.03 SCHEDULE OF VALUES

- A. Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Submit a draft Schedule of Values to the Owner at the earliest feasible date, but in no case later than Preconstruction Meeting. Refer to the suggested Schedule of Values format attached to this section.
 - 2. Sub-Schedules: Where the Work is separated into Sectors that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.
 - 1. Identification: Include the following project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of the Architect
 - c. Project Number
 - d. Contractor's name and address
 - e. Date of submittal
 - 2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed (see Schedule of Values format attached this section):
 - a. Generic name
 - b. Related Specification Section

PAYMENT APPLICATION PROCEDURES
SECTION 01027

- c. Change Orders (numbers) that have affected value
 - d. Dollar Value
 - e. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent
3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items:
 - a. A value will be given for at least every major specification section (subsections can logically be grouped together).
 - b. A single material subcontractor (i.e. sod, window blinds) will not be required to be broken down into labor and material unless it is anticipated the materials will be stored and invoiced prior to installation.
 - c. All multiple item subcontracts or work items (i.e. concrete, roofing, painting, mechanical, electrical items, etc.) will be shown broken down at least in labor and material (all taxes, burden and overhead and profit included).
 - d. Mobilization (move-on, bond, insurance, temporary office and sanitary service installation) shall not exceed 2 1/2% of contract price.
 - e. For multi-story work all items broken down per floor.
 - f. Concrete broken down at least into foundation slab on grade, columns, beams and suspended slabs.
 - g. Masonry divided into C.M.U. brick, stem walls, exterior walls, interior walls and elevator shaft.
 - h. Plumbing broken down at least into underslab rough-in, vents and stacks supply piping, equipment items (each listed separately), fixtures and trim.
 - i. HVAC: Typically shown per specification section, labor and material, per floor.
 - j. Electrical: same as HVAC.
 - k. Fire protection broken down at least into underground, rough-in and trim. All per building and labor and material.
 - l. Logical grouping of specification subsections is permitted.
4. Round amounts off the nearest whole dollar, the total shall equal the Contract Sum.
5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
6. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead

PAYMENT APPLICATION PROCEDURES
SECTION 01027

and profit margin.

a. At the Contractors' option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distributed as general overhead expense.

7. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the contract sum.

1.04 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as reviewed by the Owner representative and paid for by the Owner.
1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the Final Application for Payment involve additional requirements. See items G, I, J and K of this section.
- B. Payment Application Times: The period of construction work covered by each Application of Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use the County's most updated form as the form for Application for Payment. Form given at the Preconstruction Conference.
- D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
1. Entries shall match data on the Schedule of Values and Contractors' Construction Schedule. Use updated schedules if revisions have been made.
2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
- E. Transmittal: Submit **five (5) original executed copies** of each Application for Payment to the Project Manager by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.
1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Project Manager.
- F. Payment will be processed once a month. Payment for item will be based on percentage completed as determined and approved by the County Project Manager or invoice for stored materials. Retainage of 10% will be held for all applications until 50% completion

PAYMENT APPLICATION PROCEDURES
SECTION 01027

has been reached, at which point of time retainage will be reduced to 5% in accordance with Florida Prompt Payment Act.

- G. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work. Application shall also include all items listed in Part H. below..
- H. Final Payment Application: Administrative actions and submittals, which must precede or coincide with submittal of the final payment. Application for Payment includes the following:
 - 1. Completion of Project Close-Out requirements
 - 2. Completion of items specified for completion after Substantial Completion (Punch List)
 - 3. Notarized Contractor's release of lien (on Owner's form)
 - 4. Notarized Subcontractor and material supplier release of lien
 - 5. Notarized Consent of Surety
 - 6. Notarized Power of attorney
 - 7. Notarized Asbestos-free letter

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

CONTRACT MODIFICATION PROCEDURES / CHANGE ORDERS

SECTION 01035

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This section specifies administrative and procedural requirements for handling and processing Contract modifications.

1.03 MINOR CHANGES IN THE WORK

- A. Supplemental instructions authorizing minor changes in the work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Project Manager.

1.04 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Proposed changes in the work that will require adjustment to the Contract Sum or Contract Time will be issued by the Project Manager, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.
 - 1. Proposal requests issued by the Project Manager are for information only. Do not consider them instruction either to stop work in progress, or to execute the proposed change.
 - 2. Unless otherwise indicated in the proposal request, within 7 days of receipt of the proposal request, submit to the Project Manager for the Owner's review, an estimate of cost necessary to execute the proposed change.
 - a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include a statement indicating the effect the proposed change in the work will have on the Contract Time.
 - d. Contractor and subcontractors will provide a complete detailed labor and material breakdown to justify change order request amount.
- B. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions in mutual accord with the Owner Representative's findings require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.

CONTRACT MODIFICATION PROCEDURES / CHANGE ORDERS

SECTION 01035

1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
2. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section 01631 Product Substitutions- if the proposed change in the work requires that substitution of one product or system for a product or system not specified.
5. Contractor and subcontractors will provide a complete detailed labor and material breakdown to justify change order request amounts.

1.05 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Project Manager may issue a Construction Change Directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.06 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Change Order Proposal Request, the Project Manager will issue a Change Order for signatures of the Owner and Contractor on County's Change Order form, as provided in the Conditions of the Contract.

PART 2 PRODUCTS (Not Applicable)

CONTRACT MODIFICATION PROCEDURES / CHANGE ORDERS
SECTION 01035

PART 3 EXECUTION (Not Applicable)

END OF SECTION

ADMINISTRATIVE REQUIREMENTS & PROJECT COORDINATION
SECTION 01040

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Coordination and project conditions.
 - 2. Coordination with Owner Requirements
 - 3. Preconstruction meeting.
 - 4. Site mobilization meeting.
 - 5. Progress meetings.
 - 6. Pre-installation meetings.
 - 7. General Installation provisions
 - 8. Cutting and patching.
 - 9. Special procedures.
 - 10. Cleaning and protection

- B. Related Documents
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.

- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

- D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

- E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's occupancy.

ADMINISTRATIVE REQUIREMENTS & PROJECT COORDINATION
SECTION 01040

- F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 COORDINATION WITH OWNER REQUIREMENTS

- A. The Owner will be occupying the building during the work. All existing exits and any existing fire protection/life safety systems shall be continuously maintained and operational unless other measures are taken which provide equivalent safety per the Florida Building Code requirements. The contractor is to submit a "Construction Safety Plan" depicting how they will keep exit ways protected and in a safe condition while the buildings are occupied. Stipulate how the fresh air and exhaust fans will be kept in continued use while the buildings are occupied.
- B. Stipulate in the "Construction Safety Plan" how the contractor will keep the building(s) occupied during the roof replacement operations.
- C. Roof loading and overhead crane operations shall be scheduled as much as practicable during times the facilities are unoccupied.
- D. HVAC exhaust and fresh air equipment are not to be shut down while the buildings are occupied without Owner's prior knowledge and permission.
- E. Contractor shall consult with local governing authorities having jurisdiction regarding noise abatement requirements and construction operations, if applicable.
- F. A copy of all required city, county and state licenses that are applicable to this project shall be supplied to the Owner's representative prior to the appropriate work commencing.
- G. The Contractor shall perform any trimming, pruning or relocation of trees or significant landscape materials as needed to fulfill the requirements of work on this project. Failure to adequately protect the existing landscaping material will require replacement of these materials at no additional cost to the Owner.
- H. The Contractor and contractor personnel shall observe the following rules of conduct prescribed by the owner in regard to work on this project. They include but are not limited to:
 - 1. Workmen are not to traverse any walkway between buildings or buildings that are not included in this contract as well as new work that has been completed.
 - 2. All contractor and subcontractor vehicles are to be parked in designated areas only. This will be determined during the pre-construction meeting.
 - 3. Smoking is not permitted on the entire property. The Owner has a non smoking policy which will be furnished to the Contractor with the expectation that the policy will be strictly enforced for the entire duration of the project.
 - 4. Radios, tape or CD players ("boom boxes") are not to be utilized at the site.
 - 5. No firearms or other weapons are to be brought to the site

ADMINISTRATIVE REQUIREMENTS & PROJECT COORDINATION
SECTION 01040

- 6. Contractor shall coordinate project access, parking and egress of all personnel and tradesmen with the Owner and the Owner's administrative personnel.
- I. Lack of coordination as specified in this and other sections of the contract documents are grounds for assessment of back charges and/or termination in order to remediate the situation

1.4 PRECONSTRUCTION MEETING

- A. Owner will schedule meeting after contract is executed.
- B. Attendance Required: Owner, Architect/Engineer, Contractor and any subcontractors and suppliers the contractor may wish to include.
- C. At the Preconstruction meeting submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers
- D. Agenda:
 - 1. Distribution of Contract Documents.
 - 2. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
 - 3. Designation of personnel representing parties in Contract, and Architect/Engineer.
 - 4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal requests, Change Orders, and Contract closeout.
 - 5. Scheduling.
- E. Contractor shall record minutes and distribute copies within three days after meeting to participants, with two copies to Architect/Engineer, Owner, and those affected by decisions made.

1.5 SITE MOBILIZATION MEETING

- A. Owner will schedule meeting at Project site prior to Contractor occupancy.
- B. Attendance Required: Owner, Architect/Engineer, Special Consultants, Contractor, Contractor's Superintendent, and major Subcontractors.
- C. Agenda:
 - 1. Use of premises by Owner and Contractor.
 - 2. Owner's requirements and occupancy.
 - 3. Construction facilities and controls provided by Owner.
 - 4. Temporary utilities provided by Owner.
 - 5. Security and housekeeping procedures.
 - 6. Schedules.

ADMINISTRATIVE REQUIREMENTS & PROJECT COORDINATION
SECTION 01040

- 7. Application for payment procedures.
 - 8. Procedures for testing.
 - 9. Procedures for maintaining record documents.
- D. Contractor shall record minutes and distribute copies within three days after meeting to participants, with two copies to Architect/Engineer, Owner, and those affected by decisions made.

1.6 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum bi-weekly intervals.
- B. Contractor shall make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems impeding planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Coordination of projected progress.
 - 11. Maintenance of quality and work standards.
 - 12. Effect of proposed changes on progress schedule and coordination.
 - 13. Other business relating to Work.
- E. Contractor shall record minutes and distribute copies within three days after meeting to participants, with two copies to Architect/Engineer, Owner, and those affected by decisions made.

1.7 PRE-INSTALLATION MEETINGS

- A. When required in individual specification sections, convene pre-installation meetings at Project site prior to commencing work of specific section.
- B. Require attendance of parties directly affecting, or affected by, Work of specific section.
- C. Notify Architect/Engineer four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:

ADMINISTRATIVE REQUIREMENTS & PROJECT COORDINATION
SECTION 01040

1. Review conditions of installation, preparation and installation procedures.
 2. Review coordination with related work.
- E. Record minutes and distribute copies within three days after meeting to participants, with two copies to Architect/Engineer, Owner, and those affected by decisions made.

PART 2 PRODUCTS – (Not Used)

PART 3 EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- D. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion and building movement.
- E. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to Project Manager for final decision.
- F. Recheck measurements and dimensions, before starting each installation.
- G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect/Project Manager for final decision.

ADMINISTRATIVE REQUIREMENTS & PROJECT COORDINATION
SECTION 01040

3.2 CUTTING AND PATCHING

- A. Employ skilled and experienced personnel to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements affecting:
 - 1. Structural integrity of element.
 - 2. Integrity of weather-exposed or moisture-resistant elements.
 - 3. Efficiency, maintenance, or safety of element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate contractor.
- C. Execute cutting, fitting, and patching to complete Work, and to:
 - 1. Fit the several parts together, to integrate with other Work.
 - 2. Uncover Work to install or correct ill-timed Work.
 - 3. Remove and replace defective and non-conforming Work.
 - 4. Remove samples of installed Work for testing.
 - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products in accordance with requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material to full thickness of penetrated element.
- J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- K. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

3.3 SPECIAL PROCEDURES

- A. Materials: As specified in product sections; match existing with new products for patching and extending work.
- B. Employ skilled and experienced personnel to perform alteration work.

ADMINISTRATIVE REQUIREMENTS & PROJECT COORDINATION
SECTION 01040

- C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- E. Remove debris and abandoned items from area and from concealed spaces.
- F. Prepare surface and remove surface finishes to permit installation of new work and finishes.
- G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- H. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to original or specified condition.
- I. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- J. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect/Engineer for review.
- K. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing smooth transition; to Architect/Engineer for review. Request instructions from Architect/Engineer.
- L. Trim existing doors to clear new floor finish. Refinish trim to original or specified condition.
- M. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- N. Finish surfaces as specified in individual product sections.

3.4 CLEANING AND PROTECTION

- A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- B. Clean and maintain completed construction as directed by the Project Manager and as frequently as necessary to ensure its integrity and safety through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

ADMINISTRATIVE REQUIREMENTS & PROJECT COORDINATION
SECTION 01040

- C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where the applicable, such exposures include, but are not limited to, the following:
1. Excessive static or dynamic loading.
 2. Excessively high or low temperatures
 3. Excessively high or low humidity
 4. Air contamination or pollution
 5. Water
 6. Solvents
 7. Chemicals
 8. Soiling, staining and corrosion
 9. Rodent and insect infestation
 10. Combustion
 11. Destructive testing
 12. Misalignment
 13. Excessive weathering
 14. Unprotected storage
 15. Improper shipping or handling
 16. Theft
 17. Vandalism

END OF SECTION

CUTTING AND PATCHING

SECTION 01045

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for cutting and patching.
- B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - 1. Requirements of this Section apply to mechanical and electrical installations. Refer to Division-15 and Division-16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.03 SUBMITTALS

- A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:
 - 1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
 - 2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
 - 3. List products to be used and firms or entities that will perform Work.
 - 4. Indicate dates when cutting and patching is to be performed.
 - 5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
 - 6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

CUTTING AND PATCHING SECTION 01045

7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.04 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load carrying capacity or load-deflection ratio.
 1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements.
 - a. Foundation construction
 - b. Bearing and retaining walls
 - c. Structural concrete
 - d. Structural steel
 - e. Lintels
 - f. Timber and primary wood framing
 - g. Structural decking
 - h. Miscellaneous structural metals
 - i. Stair systems
 - j. Exterior curtain wall construction
 - k. Equipment supports
 - l. Piping, ductwork, vessels and equipment
 - m. Structural systems of special construction in Division 13.
- B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety. Refer to Divisions 15 and 16 regarding Fire Rated Penetrations.
 1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems.
 - a. Shoring, bracing and sheeting
 - b. Primary operational systems and equipment
 - c. Air or smoke barriers
 - d. Water, moisture, or vapor barriers
 - e. Membranes and flashings
 - f. Fire protection systems
 - g. Noise and vibration control elements and systems
 - h. Control systems
 - i. Communication systems
 - j. Conveying systems
 - k. Electrical wiring systems
 - l. Special construction specified by Division-13 Sections

CUTTING AND PATCHING

SECTION 01045

- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace work cut and patched in a visually unsatisfactory manner.
1. If possible retain the original installer or fabricator to cut and patch the following categories of exposed work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:
 - a. Processed concrete finishes
 - b. Preformed metal panels
 - c. Window wall system
 - d. Stucco and ornamental plaster
 - e. Acoustical ceilings
 - f. Carpeting
 - g. Wall covering
 - h. HVAC enclosures, cabinets or covers
 - i. Roofing systems

PART 2 PRODUCTS

2.01 MATERIALS

- A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect unless otherwise indicated by Architect/Owner. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 EXECUTION

3.01 INSPECTION

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.
1. Before proceeding, meet at the site with all parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

CUTTING AND PATCHING SECTION 01045

- A. Temporary Support: Provide temporary support of work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas and interruption of free passage to adjoining areas.
- D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.
 - 1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Cut through concrete and masonry using a cutting machine such as carborundum saw or diamond core drill.
 - 4. Comply with requirements of applicable Sections of Division-2 where cutting and patching required excavating and backfilling.
 - 5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with

CUTTING AND PATCHING

SECTION 01045

specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials if necessary to achieve uniform color and appearance.
 - a. Where patching occurs in smooth painted surfaces, extend final coat over entire unbroken surfaces containing the patch, after the patched area has received primer and second coat.

3.04 CLEANING

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged materials to their original condition.

END OF SECTION

REFERENCE STANDARDS AND DEFINITIONS

SECTION 01095

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. Indicated: The term *indicated* refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as shown, noted, scheduled and specified are used, it is to help the reader locate the reference; no limitation on location is intended.
- C. Directed: Terms such as directed, requested, authorized, selected, accepted, required, and permitted mean directed by the Project Manager, requested by the Architect/Project Manager and similar phrases.
- D. Approved: This term approved means accepted, where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. Regulations: The term Regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. Furnish: The term furnish is used to mean supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. Install: The term install is used to describe operations at project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. Provide: The term provide means to furnish and install, complete and ready for the intended use.
- I. Installer: An Installer is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. The term experienced, when used with the term Installer, means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with

REFERENCE STANDARDS AND DEFINITIONS

SECTION 01095

requirements of the authority having jurisdiction.

2. Trades: Use of titles such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.

- J. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

- K. Testing Laboratories: A testing laboratory is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.03 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16 Division format and MASTER FORMAT numbering system.

- B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
 1. Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Words and meaning shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.

 2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
 - a. The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.

1.04 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect

REFERENCE STANDARDS AND DEFINITIONS

SECTION 01095

as if bound or copies directly into the Contract Documents to the extend reference. Such standards are made part of the Contract Documents by reference.

- B. Publication Dates: Comply with the standard in effect as of the date of the Contract Documents.
- C. Conflicting Requirements: Where compliances with two or more standards are specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels. Refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.
 - 1. Minimum Quantity of Quality Levels: The quantity of quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Architect/Owner for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed for performance of a required construction activity. The Contractor shall obtain copies directly from the publication source or any other authorized source.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. See Trade Reference List at the end of this Section refer to the Encyclopedia of Associations, published by Gale Research Co., available in most libraries.

1.05 GOVERNING REGULATIONS/AUTHORITIES

- A. The Architect has contacted authorities having jurisdiction where necessary to obtain information necessary the preparation of Contract Documents. Contact authorities having jurisdiction directly for information and decisions having a bearing on the work.

1.06 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulation bearing

REFERENCE STANDARDS AND DEFINITIONS
SECTION 01095

upon performance of the Work.

1.07 TRADE REFERENCES

Acronyms for abbreviations used in the Specifications or other Contract Documents mean the recognized name of the trade association, standards generating organization, authority that have jurisdiction or other entity applicable to the context of the text provision.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturer's Association
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACIL	American Council of Independent Laboratories
ACPA	American Concrete Pipe Association
ADC	Air Diffusion Council
AGA	American Gas Association
AHA	American Hardboard Association
AI	Asphalt Institute
AIHA	American Industrial Hygiene Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
APA	American Plywood Association
ARI	Air Conditioning and Refrigeration Institute
ASA	Acoustical Society of America

REFERENCE STANDARDS AND DEFINITIONS

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ASC	Adhesive and Sealant Council
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society of Testing of Materials
AWI	Architectural Woodwork Institute
AWPB	American Wood Preservers Bureau
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders □ Hardware Manufacturers Association
CISPI	Cast Iron Soil Pipe Institute
CRSI	Concrete Reinforcing Steel Institute
DHI	Door and Hardware Institute
DLPA	Decorative Laminate Products Association
EIMA	Exterior Insulation Manufacturers Association
FGMA	Flat Glass Marketing Association
FM	Factory Mutual Engineering and Research
GA	Gypsum Association
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronic Engineers
IESNA	Illuminating Engineering Society of North America
MBMA	Metal Building Manufacturer's Association

REFERENCE STANDARDS AND DEFINITIONS
SECTION 01095

ML/SFA	Metal Lath/Steel Framing Association
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
NAAMM	National Association of Architectural Metal Manufacturers
NAPA	National Asphalt Pavement Association
NAPF	National Association of Plastic Fabricators (Now DLPA)
NBHA	National Builder's Hardware Association (Now DHI)
NCMA	National Concrete Masonry Association
NEC	National Electric Code
NECA	National Electric Contractors Association
NEII	National Elevator Industry, Inc.
NFPA	National Fire Protection Association
NHLA	National Hardwood Lumber Association
NPA	National Particle board Association
NPCA	National Paint and Coatings Association
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NWMA	National Woodwork Manufacturers Association (Now NWWDA)
NWWDA	National Wood Window and Door Association (Formerly NWMA)
PDI	Plumbing and Drainage Institute
RFCI	Resilient Floor Covering Institute
RMA	Rubber Manufacturers Association
SDI	Steel Deck Institute
S.D.I.	Steel Door Institute
SGCC	Safety Glazing Certification Council

REFERENCE STANDARDS AND DEFINITIONS
SECTION 01095

SHLMA	Southern Hardwood Lumber Manufacturers Association (Now HMA)
SIGMA	Sealed Insulating Glass Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SJI	Steel Joist Institute
SPRI	Single Ply Roofing Institute
SSPC	Steel Structures Painting Council
SWI	Steel Window Institute
TCA	Tile Council of America
UL	Underwriters Laboratories
WCMA	Wall Covering Manufacturers Association
WRI	Wire Reinforcement Institute
WSFI	Wood and Synthetic Flooring Institute

1.08 FEDERAL GOVERNMENT AGENCIES

- A. Names and titles of federal government standard or Specification producing agencies are frequently abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard of Specification producing agencies of the federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up-to-date as of the date of the Contract Documents.

CE	Corps of Engineers (US Department of the Army) Chief of Engineers - Referral Washington, DC 20314	(202) 272-0660
CFR	Code of Federal Regulations Available from the Government Printing Office North Capitol St. Between G and H Street, NW Washington, DC 20402	(202) 783-3238

(MATERIAL IS USUALLY FIRST PUBLISHED IN THE FEDERAL REGISTER)

CPSC	Consumer Product Safety Commission
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REFERENCE STANDARDS AND DEFINITIONS
SECTION 01095

	5401 Westbard Avenue Washington, DC 20816	(800) 638-2772
CS	Commercial Standard (US Department of Commerce) Government Printing Office Washington, DC 20402	(202) 377-2000
DOC	Department of Commerce 14th Street and Constitution Ave., NW Washington, DC 20230	(202) 377-2000
DOT	Department of Transportation 400 Seventh St., SW Washington, DC 20590	(202) 426-4000
EPA	Environmental Protection Agency 401 M. St., SW Washington, DC 20460	(202) 382-2090
FAA	Federal Aviation Administration (U.S. Department of Transportation) 800 Independence Avenue SW Washington, DC 20590	(202) 366-4000
FCC	Federal Communications Commission 1919 M. Street NW Washington, DC 20554	(202) 632-7000
NBS	National Bureau of Standards (U.S. Department of Commerce) Gaithersburg, MD 20899	(301) 921-1000
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor) Government Printing Office Washington, DC 20402	(202) 523-7001
PS	Product Standard of NBS (U.S. Department of Commerce) Government Printing Office Washington, DC 20402	(202) 783-3238
USDA	U.S. Department of Agriculture Independence Avenue Between 12th and 14 Street, SW Washington, DC 20250	(202) 447-8732

REFERENCE STANDARDS AND DEFINITIONS
SECTION 01095

PART 2 PRODUCTS
(Not Applicable)

PART 3 EXECUTION
(Not Applicable)

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Identification of each unit price by letter and description.

- B. Related Sections:
 - 1. Agreement: Monetary values of established Unit Prices and Percentage allowances for Contractor's overhead and profit
 - 2. General Conditions: Governing requirements for changes in the Work, in Contract Sum/Price and Contract Time.
 - 3. Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.
 - 4. Section 01027 – Payment Application Procedures
 - 5. Section 01300 – Submittal Procedures
 - 6. Section 01700 – Project Closeout Requirements

1.2 UNIT PRICE CONDITIONS

- A. Drawings and general provisions of Contract, including General Conditions, Supplementary Conditions and other Division 01 specification sections apply to work of this section.

- B. Unit Prices for products shall be stated in the blank spaces provided in the proposal form and the cost of the estimated quantities of products shall be included in the Base Bid.

- C. The Owner reserves the right to reject or accept any Unit Price based solely on his judgment of what constitutes a "fair price". The fairness of any unit price will be affected by the potential for Owner credit for unused Unit Price quantities.

1.3 UNIT PRICES FOR PRODUCTS

- A. The amount of each Unit Price is to be based on the actual quantity of existing material removed and/or replaced and shall include the following:
 - 1. The cost of the product to the Contractor or Subcontractor, less any applicable trade discounts.
 - 2. Delivery to the Site.
 - 3. All equipment and labor required.
 - 4. Applicable taxes and necessary bonds or insurance.
 - 5. Handling at the Site, including unloading, uncrating, and storage.
 - 6. Protection from the elements and from damage.
 - 7. Labor for installation and finishing, and other expenses required to complete the installation.

8. Contractor's and Subcontractor's overhead and profit.
 9. Excess material used due to waste, overlap of materials, purchase quantity limitations and similar factors.
- B. Adjustments for Costs:
1. Should the quantities be more or less than the specified quantity in the base bid, the Contract Sum will be adjusted accordingly by Change Order.
 2. The Unit Price shall apply to the quantities actually used as determined by periodic field inspections by the Owner and Architect.
 3. Unit Price material and the quantities used shall be recorded on a daily basis within the Contractor's Daily Report, and be accompanied by photographs of the conditions prior to removal of the old material, and conditions after installation of the new replacement material.
 4. The Unit Price quantity records are to be reviewed with the Owner and Architect at each Project Progress Meeting. Acceptances of quantities used to date are to be documented in the Meeting Minutes.
 5. If these documentation and approval procedures are not followed by the contractor, a later request for award of Unit Price Costs may be denied by the Owner and Architect.

1.4 DESCRIPTION OF UNIT PRICES

- A. **Unit Price A:** Cost per unit to provide **supplemental structural support** for unsupported mechanical unit and fan curbs as detailed in the structural drawings provided. The exact locations and extent of replacement to be determined in the field by the Owner and Architect. The base proposal shall include removal and replacement of **20 60"x60" curbs** where in the process of flashing the curbs, they are identified to be unsupported to structural members or joists below the roof deck. If any of this quantity is not used, the Owner shall receive a credit for that quantity based on the unit price.
- B. **Unit Price B:** Cost per square foot to remove and replace existing deteriorated **lightweight insulating concrete** and replace with new lightweight insulating concrete in like kind (or appropriate manufacturer recommended patching material). The exact locations and extent of replacement to be determined in the field by the Owner and Architect. The base proposal shall include removal and replacement of **2,000 cubic feet** of damaged lightweight insulating concrete. If any of this quantity is not used, the Owner shall receive a credit for that quantity based on the unit price.
- C. **Unit Price C:** Cost per square foot to remove and replace existing deteriorated **rigid non-tapered insulation** and replace with new rigid insulation in like kind. The exact locations and extent of replacement to be determined in the field by the Owner and Architect. The base proposal shall include removal and replacement of **25,000 square feet** of 2" thick non-tapered rigid insulation. If any of this quantity is not used, the Owner shall receive a credit for that quantity based on the unit price.

**UNIT PRICES
SECTION 01220**

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

SUBMITTAL PROCEDURES
SECTION 01300

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:

- 1. Contractor's Construction Schedule
- 2. Submittal Schedule
- 3. Daily Construction Reports
- 4. Shop Drawings
- 5. Product Data
- 6. Samples

- B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

- 1. Permits
- 2. Applications for Payment
- 3. Performance and Payment Bonds
- 4. Insurance Certificates
- 5. List of Subcontractors with start and finish dates (update as necessary)
- 6. Schedule of Values
- 7. Construction Schedule

- C. The Schedule of Values submittal is included in Section 01027 - Applications for Payment.

- D. Inspection and test reports are included in Division 1 - Quality Control Services.

1.03 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

- 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
- 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals

SUBMITTAL PROCEDURES SECTION 01300

concurrently for coordination.

- a. The Project Manager reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
- a. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Project Manager will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow two weeks for reprocessing each submittal.
 - d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 2. Include the following information on the label for processing and recording action taken.
 - a. Project name
 - b. Date
 - c. Name and address of Architect
 - d. Name and address of Contractor
 - e. Name and address of subcontractor
 - f. Name and address of supplier
 - g. Name of manufacturer
 - h. Number and title of appropriate Specification Section
 - i. Drawing number and detail references, as appropriate.
- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Project Manager using transmittal form as provided by the Project Manager. Submittals received from sources other than the Contractor will be returned without action.

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1. On the transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitation. Include Contractor's certification that information complies with Contract Document requirements.
 2. Transmittal Form: As provided by the Project Manager
- D. Contractor shall be responsible for cost of re-review of rejected submittals, shop drawing, etc.
- E. Substitution request to specified products will be made within 30 days after contract award. After the 30 day period, no requests for substitutions from the Contractor will be considered.
1. Substitution submitted within the first 30 days will have product data from specified and requested substitute submitted together and demonstrate better quality, cost savings if of equal quality, or show benefit to the County for accepting the substitute.
- F. Once submittals are approved or approved as noted, they will be scanned and converted to PDF documents with OCR (optical character recognition) and given to the owner.
- 1.04 CONTRACTOR'S CONSTRUCTION SCHEDULE
- A. See General Conditions: Article 18
- .
- 1.05 SUBMITTAL LOG
- A. After development and acceptance of the Contractor's construction schedule, prepare a complete log of submittals.
1. Coordinate submittals log with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.
 2. Prepare the log in chronological order; include all submittals required. Provide the following information:
 - a. Scheduled date for the first submittal
 - b. Related Section number
 - c. Submittal category
 - d. Name of subcontractor
 - e. Description of the part of the work covered
 - f. Scheduled date for resubmittal
 - g. Scheduled date the Architect's final release or approval.
 3. All submittals must be received within the first 25% of contract time.

SUBMITTAL PROCEDURES SECTION 01300

- B. Distribution: Following response to initial submittal, print and distribute copies to the Project Manager, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Log Updating: Revise the log after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.06 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Project Manager at weekly intervals:
 - 1. List of subcontractors at the site
 - 2. Approximate count of personnel at the site
 - 3. High and low temperatures, general weather conditions
 - 4. Accidents and unusual events
 - 5. Meetings and significant decisions
 - 6. Stoppages, delays, shortages, losses
 - 7. Meter readings and similar recordings
 - 8. Emergency procedures
 - 9. Orders and requests of governing authorities
 - 10. Change Orders received, implemented
 - 11. Services connected, disconnected
 - 12. Equipment or system tests and start-ups
 - 13. Partial completions, occupancies
 - 14. Substantial Completions authorized

1.07 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered a Shop Drawings and will be rejected.
- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
 - 1. All required dimensions
 - 2. Identification of products and materials included

SUBMITTAL PROCEDURES
SECTION 01300

3. Compliance with specified standards
 4. Notation of coordination requirements
 5. Notation of dimensions established by field measurement
 6. Sheet Size: Except for templates, patterns and similar full-size Drawings on sheets at least 8 1/2" x 11" but no larger than 24" x 36".
 7. Initial Submittal: Submit one correctable translucent reproducible print and one blue-or black-line print for the Project Manager's review; the reproducible print will be returned.
 8. Initial Submittal: Submit 2 blue-or black-line prints for the Architect's review; one will be returned.
 9. Final Submittal: Submit 3 blue-or black-line prints; submit 5 prints where required for maintenance manuals. 2 prints will be retained; the remainder will be returned. One of the prints returned shall be marked-up and maintained as a Record Documents.
 10. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connections with construction.
- C. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.
1. Preparation of coordination Drawings is specified in section Project Coordination and may include components previously shown in detail on Shop Drawings or Product Data.
 2. Submit coordination Drawings for integration of different construction elements. Show sequence and relationships of separate components to avoid any conflict including conflicts in use of space.
 3. Contractor is not entitled to additional payments due to lack of compliance with this Section.

1.08 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawing".
1. Mark each copy to show applicable choices and options. When printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations

SUBMITTAL PROCEDURES
SECTION 01300

- b. Compliance with recognized trade association standards
 - c. Compliance with recognized testing agency standards
 - d. Application of testing agency labels and seals
 - e. Notation of dimensions verified by field measurement
 - f. Notation of coordination requirements
 - g. Manufacturers local representative and phone number.
2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 3. Preliminary Submittal: Submit a preliminary single-copy of Product Data where selection of options is required.
 4. Submittals: **Submit six (6) copies** of each required submittal. The Project Manager will return two (2) sets to the Contractor marked with action taken and corrections or modifications required.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 5. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
 - a. Do not proceed with installation until an applicable copy of Product Data applicable is in the Installer's possession.
 - b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.09 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of materials, color range sets, and swatches showing color, texture and pattern.
 1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's/Owner's Sample. Include the following:
 - a. Generic description of the Sample
 - b. Sample source
 - c. Product name or name of manufacturer
 - d. Compliance with recognized standards
 - e. Availability and delivery time
 2. Submit Samples for review of kind, color, pattern, and texture, for a final check of

SUBMITTAL PROCEDURES SECTION 01300

these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

- a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
 - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
3. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
- a. Preliminary submittals will be reviewed and returned with the Architect's/Owner's mark indicating selection and other action.
4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.
5. Maintain sets of Samples, as returned, at the project site, for quality comparisons throughout the course of construction.
- a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 - b. Sample sets may be used to obtain final acceptance of the construction associated with each set.
- B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
1. Field Samples specified in individual sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the work will be judged.
 - a. Comply with submittal requirements. Process transmittal forms to provide a record of activity.

1.10 ARCHITECT'S ACTION

- A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect/Project Manager will review each submittal, mark to

SUBMITTAL PROCEDURES
SECTION 01300

indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Contractor's responsibility.
- B. Action Stamp: The Architect/Project Manager will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, similarly as follows, to indicate the action taken:
1. Final Unrestricted Release: Where submittals are marked "**No Exceptions Taken**" - **APP**, that part of the work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
 2. Final-But-Restricted Release: When submittals are marked "**Make Corrections As Noted**" - **A/C**, that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
 3. Returned for Resubmittal: When submittal is marked "**Revise and Resubmit**" - **R/R**, do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
 - a. Do not permit submittals marked "**Revise and Resubmit**" to be used at the Project site, or elsewhere where work is in progress.
 4. Rejected: When submittal is marked "**Rejected**" - **REJ** it does not comply with requirements of the Contract Documents. Submittal must be discarded and entirely new submittal shall be forwarded to the Project Manager without delay.

PART 2 PRODUCTS

(Not Applicable)

PART 3 Execution

(Not Applicable)

END OF SECTION

**SUBMITTAL PROCEDURES
SECTION 01300**

SUBMITTAL COVER FORM



A/R/C
Associates
Incorporated

SUBMITTAL NO. _____	A/R/C PROJECT NO: 16032.00
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PROJECT: OCCC West Building Roof Repairs	OWNER'S PROJECT NO. Y16-807-MM
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ITEM: _____ *	DATE: _____
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SPEC. SECTION: _____ PARAGRAPH NO: _____

PRIME CONTRACTOR _____	CHECKED AND APPROVED FOR SUBMISSION BY: _____ DATE _____
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SUBCONTRACTOR: _____ MANUFACTURER: _____

(RESERVE THE SPACE BELOW FOR COMMENTS OR DATE & SHOP DRAWING REVIEW STAMPS)

<u>COMMENTS / REVIEW STAMPS</u>	<u>SUBMITTAL REVIEW BY</u> <u>A/R/C ASSOCIATES, INCORPORATED</u>
	<p>Date: _____ By: _____</p> <p>Approved - APP () Approved as Corrected - A/C ()</p> <p><small>If checked above, fabrication MAY be undertaken. Approval does not authorize changes in contract Sum unless stated in separate letter or Change Order.</small></p> <p><small>If checked below, fabrication MAY NOT be undertaken. Resubmit corrected copies for final approval. Correction shall be limited to items marked.</small></p> <p>Revise and resubmit - R/R ()</p> <p>Not Approved - REJ ()</p> <p><small>Reviewing is only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The contractor is responsible for dimensions to be confirmed and correlated at the site; for information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction; and for coordination of the Work of all trades.</small></p>

THIS PAGE SHALL BE ATTACHED TO EACH COPY OF EACH SUBMITTAL

If Substitution, submittal shall include information required by the General Conditions and Section 012500.

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities:
 - 1. Temporary electricity.
 - 2. Temporary water service.
 - 3. Temporary sanitary facilities.

- B. Construction Facilities:
 - 1. Field offices and sheds.
 - 2. Vehicular and pedestrian access.
 - 3. Parking.
 - 4. Progress cleaning and waste removal.
 - 5. Fire prevention facilities.

- C. Temporary Controls:
 - 1. Barriers.
 - 2. Security.
 - 3. Water control.
 - 4. Noise control.

- D. Removal of utilities, facilities, and controls.

1.2 TEMPORARY ELECTRICITY

- A. Owner will pay cost of energy used. Exercise measures to conserve energy. Utilize Owner's existing power service.

- B. Provide temporary electric feeder from existing building or electrical service at location as directed by Owner. Do not disrupt Owner's use of service.

- C. Complement existing power service capacity and characteristics as required for construction operations.

- D. Provide power outlets, with branch wiring and distribution boxes located as required for construction operations. Provide GFI protected flexible power cords as required for portable construction tools and equipment.

- E. Provide main service disconnect and over-current protection at convenient location.

- F. Permanent convenience receptacles may be utilized during construction.

- G. Provide distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
 - 1. Provide 20 ampere duplex outlets, single phase circuits for power tools for every active work area.

TEMPORARY FACILITIES AND CONTROLS SECTION 01500

2. Provide 20 ampere, single phase branch circuits for lighting.

1.3 TEMPORARY WATER SERVICE

- A. Owner will pay cost of temporary water used except for water required for use in mixing of construction materials or flushing of equipment and systems. Exercise measures to conserve water.
- B. Extend branch piping with outlets located so water is available by hoses with threaded connections.

1.4 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of project mobilization.

1.5 FIELD OFFICES AND SHEDS

- A. The sheet drawings have indicated a region available for staging and mobilization.
- B. Storage Areas and Sheds (when required): Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Division 01.
- C. Removal: At completion of Work remove temporary buildings, utility services, and debris. Restore areas.

1.6 VEHICULAR AND PEDESTRIAN ACCESS

- A. Have a Maintenance of Traffic plan ready to discuss at the pre-construction meeting.
- B. Extend and relocate vehicular access as Work progress requires, provide detours as necessary for unimpeded traffic flow.
- C. Ensure access to guests remains unobstructed. Coordinate with the owner to establish acceptable maintenance of transportation for all phases of construction.
- D. Provide a non-working supervisor during all times of construction to direct traffic around all scaffolding, staging areas, and any obstructions caused by construction and ensure traffic is not impeded at any time.
- E. Provide unimpeded access for emergency vehicles.
- F. Provide and maintain access to fire hydrants and control valves free of obstructions.

1.7 PARKING

- A. Arrange with Owner for temporary parking areas to accommodate construction personnel.

TEMPORARY FACILITIES AND CONTROLS
SECTION 01500

- B. Locate as approved by Owner.
- C. When site space is not adequate, provide additional off-site parking.

1.8 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site and roof areas in clean and orderly condition.
- B. Collect and remove waste materials, debris, and rubbish from site periodically and dispose off-site.
- C. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
- D. Contractor shall provide portable trash containers for construction debris. Use of Owner's on-site containers is prohibited.

1.9 FIRE PREVENTION FACILITIES

- A. Prohibit smoking within construction areas.
- B. If allowed by Owner, a designated smoking area on site where smoking is permitted may be established. Provide approved ashtrays in designated smoking areas.
- C. Establish fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.
- D. Portable Fire Extinguishers: NFPA 10; 10 pound capacity, 4A-60B: C UL rating.
 - 1. Provide one fire extinguisher for each active construction area.
 - 2. Provide minimum one fire extinguisher in every construction trailer and storage shed.
 - 3. Provide minimum one fire extinguisher on roof during roofing operations using heat producing equipment.

1.10 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide protection for trees and landscaping designated to remain. Replace damaged trees and landscaping.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

**TEMPORARY FACILITIES AND CONTROLS
SECTION 01500**

1.11 SECURITY

- A. Security Program:
 - 1. Protect Work premises and Owner's operations from theft, vandalism, and unauthorized entry.
 - 2. Initiate program in coordination with Owner's existing security system at project mobilization.
 - 3. Maintain program throughout construction period until Owner acceptance precludes need for Contractor security.

- B. Entry Control:
 - 1. Restrict entrance of persons and vehicles into Project site.
 - 2. Allow entrance only to authorized persons with proper identification.
 - 3. Maintain daily log of workers and visitors, make available to Owner on request.
 - 4. Coordinate access of Owner's personnel to site in coordination with Owner's security forces.

- C. Personnel Identification:
 - 1. Provide identification badge to each person authorized to enter premises.
 - 2. Badge to Include: Personal photograph, name expiration date and employer.
 - 3. Maintain list of accredited persons, submit copy to Owner on request.
 - 4. Require return of badges at expiration of their employment on the Work.

1.12 WATER CONTROL

- A. Maintain site drainage affected by construction operations. Grade site to drain as required.

- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.13 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

- B. Clean and repair damage caused by installation or use of temporary work based on the existing condition assessment form.

- C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

**TEMPORARY FACILITIES AND CONTROLS
SECTION 01500**

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
- B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section 01300 -Submittals.
- C. Standards: Refer to Section 01095 - Reference Standards and Definitions for applicability of industry standards to products specified.
- D. Administrative procedures for handling requests for substitutions made after award of the Contract are included under Section 01300 - Product Substitutions.

1.03 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents such as "specialties", "systems", "structure", "finishes", "accessories", and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.
 - 1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the term "material", "equipment", "system" and terms of similar intent.
 - a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature that is current as of the date of the Contract Documents.
 - b. "Foreign Products", as distinguished from "domestic products", are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions; or produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens nor living within the United States and its possessions.
 - 2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the work.

MATERIALS AND EQUIPMENT SECTION 01600

3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.04 SUBMITTALS

- A. Product List Schedule: Prepare a schedule showing products specified in a tabular form acceptable to the Project Manager. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.
 1. Coordinate the product list schedule with the Contractor's Construction Schedule and the Schedule of Submittals.
 - a. Related Specification Section Number
 - b. Generic name used in Contract Documents
 - c. Proprietary name, model number and similar designations.
 - d. Manufacturer's name and address
 - e. Supplier's name and address
 - f. Installer's name and address
 - g. Projected delivery date, or time span of delivery period.
 2. Initial Submittal: Within 30 days after date of commencement of the work, submit 3 copies of an initial product list schedule. Provide a written explanation for omissions of data, and for known variations from Contract requirements.
 - a. At the Contractor's option, the initial submittal may be limited to product selections and designations that must be established early in the Contract period.
 3. Complete Scheduled: Within 45 days after date of commencement of the Work, submit 3 copies of the completed product list schedule. Provide a written explanation for omissions of data, and for known variations from Contract requirements.
 4. Architect's Action: The Architect will respond in writing to the Contractor within 2 weeks of receipt of the completed product list schedule. No response within this time period constitutes no objection to listed manufacturers on products, but does not constitute a waiver of the requirement that products comply with Contract Documents. The Architect's response will include the following:
 - a. A list of unacceptable product selections, containing a brief explanation of reasons for this action.

1.05 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
- B. Compatibility of Options: When the Contractor is given the option of selecting between

two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on accessible surface that is not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data.
 - a. Name of product and manufacturer
 - b. Model and serial number
 - c. Capacity
 - d. Speed
 - e. Ratings
 - f. Additional pertinent information

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deteriorating and loss, including theft.
1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
 3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
 4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
 6. Store heavy materials away from the Project structure in a manner that will not

endanger the supporting construction.

7. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate in prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 PRODUCTS

2.01 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.
 1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situation on other projects.
- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous project experience. Procedures governing product selection include the following:
 1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
 - a. Where products or manufacturers are specified by name, accompanied by the term "or equal" or "or approved equal" comply with the Contract Document provisions concerning 'substitutions to obtain approval for use of an unnamed product.
 2. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of those products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 3. Descriptive Specification Requirements: Where Specifications describe products or assemblies, listing exact characteristics required, with or without use of a brand or trade names, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

MATERIALS AND EQUIPMENT SECTION 01600

4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated.
 - a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
5. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
6. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
 - a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning 'substitutions' for selection of a matching product in another product category, or for noncompliance with specified requirements.
7. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, pattern, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.
8. Asbestos free materials: No products containing asbestos shall be used for any part of the work for this project. Provide verification.

PART 3 EXECUTION

3.01 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work.
 - 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling request for substitutions made during bidding and after award of the Contract.
- B. The Contractor's Installation Schedule and the Schedule of Submittals are included under Section 01300 - Submittals.
- C. Standards: Refer to Section 01095 – Reference Standards and Definitions for applicability of industry standards to products specified.

1.03 DEFINITIONS

- A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Requests for changes in products, materials, equipment, and methods of installation required by Contract Documents proposed by the Contractor during bidding and after award of the Contract are considered requests for "substitutions". The following are not considered substitutions:
 - 2. Revisions to Contract Documents requested by the Owner or Architect.
 - 3. Specified options of products and installation methods included in Contract Documents.
 - 4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.04 SUBMITTALS

- A. Substitution Request Submittal: After the bid is awarded, a request for substitution will be considered if received within thirty (30) days after contract award, as long as this time allowance will not impact the construction schedule.
 - 1. Submit **three (3) copies** of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.
 - 2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide

complete documentation showing compliance with the requirements for substitution, and the following information, as appropriate:

- a. Product Data, including Drawings, and descriptions of products, fabrication and installation procedures.
 - b. Samples, where applicable or requested.
 - c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
 - d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors that will become necessary to accommodate the proposed substitution.
 - e. A statement indicating the substitution's effect on the Contractor's construction schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 - f. Cost information, including a proposal of the net change, if any in the Contract Sum.
 - g. Certification by the Contractor that the Substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
3. Architect's Action: Within two weeks of receipt of the request for substitution, the Architect will request additional information or documentation necessary for evaluation of the request if needed. Within two (2) weeks of receipt of the request, or one week of receipt of the additional information or documentation, which ever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a substitute cannot be made or obtained within the time allocated, use the product specified by name. Decisions on a product substitution or its rejection by the Architect is considered final. Acceptance will be in the form of a Change Order.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

- A. Conditions: The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect; otherwise request will be returned without action except to record noncompliance with these requirements.
1. Extensive revisions to Contract Documents are not required.
 2. Proposed changes are in keeping with the general intent of Contract Documents.

3. The request is timely, fully documented and properly submitted.
 4. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the work promptly or coordinate activities properly.
 5. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
 6. A substantial advantage is offered to the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar consideration.
 7. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
 8. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
 9. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.
- B. The Contractor's submittal and Project Manager's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.
- C. Substitution request constitutes a representation that the Contractor:
1. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.
 2. Will provide the same warranty for substitution as for specified product.
 3. Will coordinate installation and make other changes which may be required for work to be complete in all respects.
 4. Waives claims for additional costs which may subsequently become apparent. All costs associated with the substitution will be paid by the Contractor regardless of

**SUBSTITUTIONS
SECTION 01631**

approvals given, and regardless of subsequent difficulties experienced as a result of substitutions.

END OF SECTION

Product Substitution Request

To: _____

We hereby submit for your consideration the following product in lieu of that specified for this project:

DRAWING NO. _____ DRAWING NAME _____

SPEC. SECTION _____ SPEC NAME _____ PARAGRAPH _____ SPECIFIED ITEM _____

Proposed Substitution: _____

Why Substitution Requested: _____

Attach complete information on changes to Drawings or Specifications which proposed substitution will require for its proper installation.

Submit with request necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance.

The undersigned certifies that the function, appearance and quality are of equal performance and assumes liability for equal performance, equal design and compatibility with adjacent materials.

Submitted by: _____
Signature (Contractor) Title Date

Firm Telephone

Address Fax Number

Signature shall be by person having authority to legally bind the Contractor to the above terms, failure to provide legally binding signature will result in retraction of approval.

<p>For use by the Architect:</p> <p><input type="checkbox"/> Recommended <input type="checkbox"/> Recommended as Noted</p> <p><input type="checkbox"/> Not Recommended <input type="checkbox"/> Received too late</p> <p><input type="checkbox"/> Insufficient data received</p> <p>By _____</p> <p>Date _____</p>	<p>For use by the Owner:</p> <p><input type="checkbox"/> Approved</p> <p><input type="checkbox"/> Not Approved</p> <p><input type="checkbox"/> Approved as noted</p> <p>By _____</p> <p>Date _____</p>
--	--

Product Substitution Information

Fill in blanks below:

A. Does the substitution affect dimensions shown on Drawings?
Yes _____ No _____ If yes, clearly indicate changes.

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitutions?
Yes _____ No _____ If no, fully explain:

C. What effect does substitution have on other Contracts or other trades?

D. What effect does substitution have an construction schedule?

E. Manufacturer's warranties of the proposed and specified items are:
_____ Same _____ Different. If different, fully explain:

F. Reason for Request:

G. Itemized comparison of specified item(s) with the proposed substitution; list significant variations:

H. This substitution will amount to a credit to the Owner of:

_____ dollars (\$_____)

I. Designation of maintenance services and sources:

**PRODUCT REQUIREMENTS
SECTION 01631**

J. Attachments: (Attach additional sheets if required.)

PROJECT CLOSEOUT REQUIREMENTS
SECTION 01700

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for project close-out, including but not limited to:
 - 1. Inspection procedures
 - 2. Project record document submittal. (substantial completion requirements)
 - 3. Operating and Maintenance Manual Submittal (substantial completion requirements).
 - 4. Submittal of warranties (substantial completion requirement).
 - 5. Final cleaning
- B. Close-out requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.
- C. Final Payment to be made when the County has received all required close-out documents.

1.03 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for Certification of Substantial Completion, complete the following: List exceptions in the request.
 - 1. In the Application for Payment that coincided with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
 - a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the work is not complete.
 - 2. Advise Owner of pending insurance change-over requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
 - 4. Obtain and submit releases enabling the Owner unrestricted use of the work and

PROJECT CLOSEOUT REQUIREMENTS
SECTION 01700

access to services and utilities; include occupancy permits, operating certificates and similar releases.

5. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Project Manager will either proceed with inspection or advise the Contractor of unfilled requirements. The Project Manager will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. Results of the completed inspection will form the basis of requirements for final acceptance.
2. Should the project fail to meet the standards required for Substantial Completion as defined in the documents, the Contractor will pay the expense of a second inspection by the Architect/Consultants and the Owner. Cost will be deducted from the Contractor's retainage.

1.04 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following list exceptions in the request:

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and complete operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect or Owner's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Project Manager.
4. Submit final meter readings for utilities, a measured record of stored fuel and similar data as of the date of Substantial Completion, or when the Owner took possession of the responsibility for corresponding elements of the Work.
5. Submit consent of surety to final payment.
6. Submit a final liquidated damages settlement statement
7. Submit evidence of final, continuing insurance coverage complying with insurance

PROJECT CLOSEOUT REQUIREMENTS
SECTION 01700

requirements.

- B. Reinspection Procedure: The Architect will reinspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Architect.
1. Upon completion of reinspection, the Architect will prepare a certification of final acceptance, or advise the contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

1.05 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation; where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Provide for project photographs if deemed necessary by Owner's representative.
1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
 2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
 3. Note related Change Order numbers where applicable.
 4. Organize record drawing sheets, and print, suitable titles, dates and other identification on the cover of each set.
 5. Provide **three (3)** additional sets of black line drawing sets of As-Builts Drawings. (color copies)
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual work performed in comparison with the text of the specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be

PROJECT CLOSEOUT REQUIREMENTS
SECTION 01700

readily discerned later by direct observation. Note related record drawing information and Project Data.

1. Upon completion of the Work, submit **two (2)** copies of Record Specifications to the Architect for the Owner's records.
- D. Record Project Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variation in actual work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications.
1. Upon completion of mark-up, submit **one (1) complete set** of Record Product Data in the three ring binder (indexed) to the Architect for the Owner's records.
- E. Record Sample Submitted: Immediately prior to the date or dates of substantial completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted Samples that have been maintained during progress of the work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to the date or dates of substantial completion, complete miscellaneous record and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Project Manager for the Owner's records.
- G. Maintenance Manuals: Organize operating and maintenance data into **five (5) suitable sets** of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:
1. Emergency instructions
 2. Spare parts list
 3. Copies of warranties
 4. Wiring diagrams
 5. Recommended turn-around cycles
 6. Inspection procedures
 7. Shop Drawings and Product Data
 8. Fixture lamping schedule

PART 2 PRODUCTS (Not Applicable)

PROJECT CLOSEOUT REQUIREMENTS
SECTION 01700

PART 3 EXECUTION

3.01 CLOSE-OUT PROCEDURES

- A. Operating and Maintenance Instructions: Arrange for each installer of equipment that required regular maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. All items shall be provided or completed prior to Certificate of Substantial Completion being issued by the Owner. Include a detailed review of the following items:
1. Maintenance manuals
 2. Record documents
 3. Spare parts and materials
 4. Tools
 5. Lubricants
 6. Fuels
 7. Identification systems
 8. Control sequences
 9. Hazards
 10. Cleaning
 11. Warranties and bonds
 12. Maintenance agreements and similar continuing commitments
 13. On-site instructions to County maintenance personnel on major systems operations such as HVAC as per technical specifications.
- B. As part of instruction for operating equipment, demonstrate the following procedures, prior to the Owner issuing Certificate of Substantial Completion:
1. Start-up
 2. Shutdown
 3. Emergency operations
 4. Noise and vibration adjustments
 5. Safety procedures
 6. Economy and efficiency adjustments

3.02 PROJECT CLOSE-OUT MANUALS AT SUBSTANTIAL COMPLETION

- A. Submit Project Close-out Manuals prior to issuance of final application for payment. Provide **three (3) copies**.
- B. Bind in commercial quality 8 ½" x 11" three ring binder, indexed with hardback, cleanable, plastic covers.
- C. Label cover of each binder with typed title PROJECT CLOSE-OUT MANUAL, with title of project; name, address, and telephone number of Contractor and name of responsible Principal.

PROJECT CLOSEOUT REQUIREMENTS
SECTION 01700

- D. Provide table of contents: Neatly typed, in the following sequence:
1. Final Certificate of Occupancy
 2. Warranty Service Subcontractors Identification List
 3. Final Lien Waivers and Releases
 4. Warranties and Guarantees
 5. Systems Operations and Maintenance Instruction
 6. Manufacturer's Certificates and Certifications
 7. Maintenance Service Contracts
 8. Spare Parts Inventory List
 9. Special Systems Operating Permits or Approvals
 10. Asbestos free materials notarized statement
- E. Provide all documents required by each specification section listed in the Project Manual. List the individual documents by section in sequence indicated in the Table of Contents of the Project Manual.
- F. Identify each document listed in the Table of Contents with the number and title of the specification section in which specified, and the name of the product or work item.
- G. Separate each section with index to sheets that are keyed to the Table of Contents listing.
- H. Warranty Service Subcontractors List shall identify subcontractor supplier, and manufacturer for each warranty with name, address and emergency telephone number.
- I. Electronic Close-out DVD: At the completion of the project, submit one copy of a DVD with entire project close out information below in PDF format. All letter, legal and brochure size sheets shall be portrait and the As-built drawings will be landscape. All fonts will be Arial. All items will be in PDF with OCR (Optical Character Recognition). This will enable a search engine to identify words on the scanned documents.
1. Contacts: Set up a separate PDF for the contacts. No bookmarks are needed for this section.
 2. As-Builts: All as-built drawings will be landscape.
 3. Submittals: All technical submittal items (approved and approved as noted) will be provided and sorted by the 16 standard divisions. Bookmarks will be needed for the appropriate divisions.
 4. Operations and Maintenance Manual: Specify the division name only in the bookmarks (1-16). Please note that all items will be in PDF with OCR (Optical Character Recognition). This will enable a search engine to identify works on the scanned documents.
 5. Permitting: This should include the Certificate of Occupancy and any other document that the Project Manager may include pertaining to the permitting for the project.

PROJECT CLOSEOUT REQUIREMENTS
SECTION 01700

3.03 FINAL CLEANING

- A. General: General cleaning during construction is required by the General Conditions and included in Section - Temporary Facilities.

- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
 - 1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
 - a. Remove labels that are not permanent labels.
 - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - c. Clean exposed exterior and interior hard-surfaced finished to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 - d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
 - e. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface. Remove waste and surplus materials from the site in an appropriate manner.

- C. Pest Control: Engage an experienced exterminator to make a final inspection, and rid the Project of rodents, insects and other pests.

- D. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction.

- E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
 - 1. Where extra materials of value remaining after completion of associated work have become the Owner's property, arrange for disposition of these materials as directed.

PROJECT CLOSEOUT REQUIREMENTS
SECTION 01700

END OF SECTION

PROJECT WARRANTIES AND BONDS
SECTION 01740

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contractor Documents, including manufacturer's standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.
 - 2. General close-out requirements are included in Section 01700 - Project Close-Out Requirements.
 - 3. Specific requirements for warranties for the work and products and installations that are specified to be warranted are included in the individual Sections of Division 2 through 16.
 - 4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.03 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.
- B. Reinstatement of Warranty. When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied

PROJECT WARRANTIES AND BONDS
SECTION 01740

warranties, and shall not limit the duties, obligation, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligation, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- E. The Owner reserves the right to refuse to accept work for the Project where a special warranty, certification, or similar commitment is required on such work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.04 WARRANTY PERIOD

- A. The Contractor shall participate with the County and the Architect's representative, at the beginning of the tenth month of the warranty period, in conducting an on-site review and evaluation of all items of equipment, materials and workmanship covered by the warranties and guarantees. Contractor shall act promptly and without cost to the County to correct all defects, problems, or deficiencies determined as such by the Architect/Owner during on the site review.
- B. All warranties and guarantees shall commence on the date of Substantial Completion except for items which are determined by the County to be incomplete or a non-comply status at the time of Substantial Completion. The coverage commencement date for warranties and guarantees of such work shall be the date of the County's acceptance of that work.
- C. Warranty period shall be manufacturer's standard for product specified except where specific warranty periods are specified in individual sections. But in no case less than one year.

1.05 SUBMITTALS

- A. Submit written warranties to the Owner prior to the date certified for Substantial Completion. If the Architect's Certificate of substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the work, submit written warranties upon request of the Project Manager.
 1. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Project Manager within fifteen days of completion of that designated portion of the work.
- B. Special Warranties: When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepared a

PROJECT WARRANTIES AND BONDS
SECTION 01740

written document that contains appropriate terms and identification, ready for executing by the required parties. Submit a draft to the Architect for approval prior to final execution.

1. Refer to individual Sections of Division 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.
- C. Form of Submittal: At Final Completion compile **two (2) copies** of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- D. Submittal Binders: Bind **three (3) sets** of warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8 1/2" by 11" paper.
1. Provide heavy paper dividers with Celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
 2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the Project title or name, and the name of the Contractor.
 3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2	PRODUCTS	(Not Applicable)
PART 3	EXECUTION	(Not Applicable)

END OF SECTION

**PROJECT WARRANTIES AND BONDS
SECTION 01740**

EXISTING CONDITION ASSESMENT (INFORMATION TO BIDDERS)
SECTION 02010

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. A/R/C – Roof Cut Data and Thermal Resistance Data (interactive PDF)
 2. Infrared Inspection Report (PDF)
 3. As-Build Drawings (Dropbox link)
 4. Photographs (Dropbox link)
- B. Related Sections:
1. Section 01010 – Summary of Work

1.2 EXISTING PROJECT / SITE CONDITIONS

- A. Field Investigation: Multiple field investigations were conducted by A/R/C Associates, Incorporated from September 7th through the 30th, 2016, at which time the exposed conditions of the proposed roof replacement areas were observed and the under-roof conditions were determined to the best extent observable without destructive methods. Limited existing construction record drawings and specifications were available for A/R/C to verify. The details of the project indicated and existing conditions are based of typical construction practice. A/R/C offers no assurance that all varying conditions have been discovered, or that any Owner-furnished information is completely accurate. It shall be the responsibility of each bidder to make additional inspections as they may judge to be a necessity.
- B. Verification of Dimensions: The approximate dimensions shown for each roof area are the result of reconstruction of the building design from field measurements taken by A/R/C Associates. This information is given to assist prospective Bidders in establishing the approximate scope of the project.
- C. Additional Information Available: Attached to this section are the results of four (4) test cuts performed at the time of the site investigation over all roof areas.
- D. Condition of Structure:
1. The Owner assumes no responsibility for actual condition of the structure.
 2. Conditions existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable. However, variations may occur by Owner's operations.
 3. Prior to bidding, inspect and verify existing conditions of Project, including elements subject to damage or to movement during project scope.
 - a. Conflicts and problems shall be reported to the Purchasing and Contracts Division for resolution prior to bidding.

EXISTING CONDITION ASSESMENT (INFORMATION TO BIDDERS)
SECTION 02010

- b. Failure to report these conflicts places the responsibility on the Prime Contractor to complete the work in accordance with the Documents at no additional cost to the Owner.
- 4. During construction, inspect conditions affecting installation of Products, or performance of work.
 - a. Report unsatisfactory or questionable conditions to Architect in writing; do not proceed with work until Architect has provided further instructions.
- E. Roof Cut Data and Thermal Resistance Data: As part of that site investigation, roof cuts were performed at various locations of the existing roof systems to determine the substrate. A thermal analysis of the materials was also done at that time. Data from those roof cuts are attached in an interactive PDF at the end of this section and are included only for informational purposes.
- F. Brady IR Infrared Inspection Report: As a part of the investigation, Brady IR conducted thermal aerial scans of the roof areas in the scope of work to identify areas where the substrate may have received moisture. The report identifies specific areas where this has been discovered. This information is only included for informational purposes.
- G. As-Build Drawings: The owner has furnished us with the as build drawings for the original Phase 2, 3 and 4 portions of the building. This information is only included for informational purposes. These are made accessible through a website link:

<https://www.dropbox.com/sh/6tt9wdq8sgvbe35/AAAHuXBiuDgGXTHP7wjonuEga?dl=0>
- H. Photographs: A/R/C took numerous photographs of the various conditions for reference during the design process. The photographs are being made accessible through a website link:

<https://www.dropbox.com/sh/0swfuhmep1knx63/AADsd9Xpou3fNnJDNDYfgio0a?dl=0>

PART 2 PRODUCTS

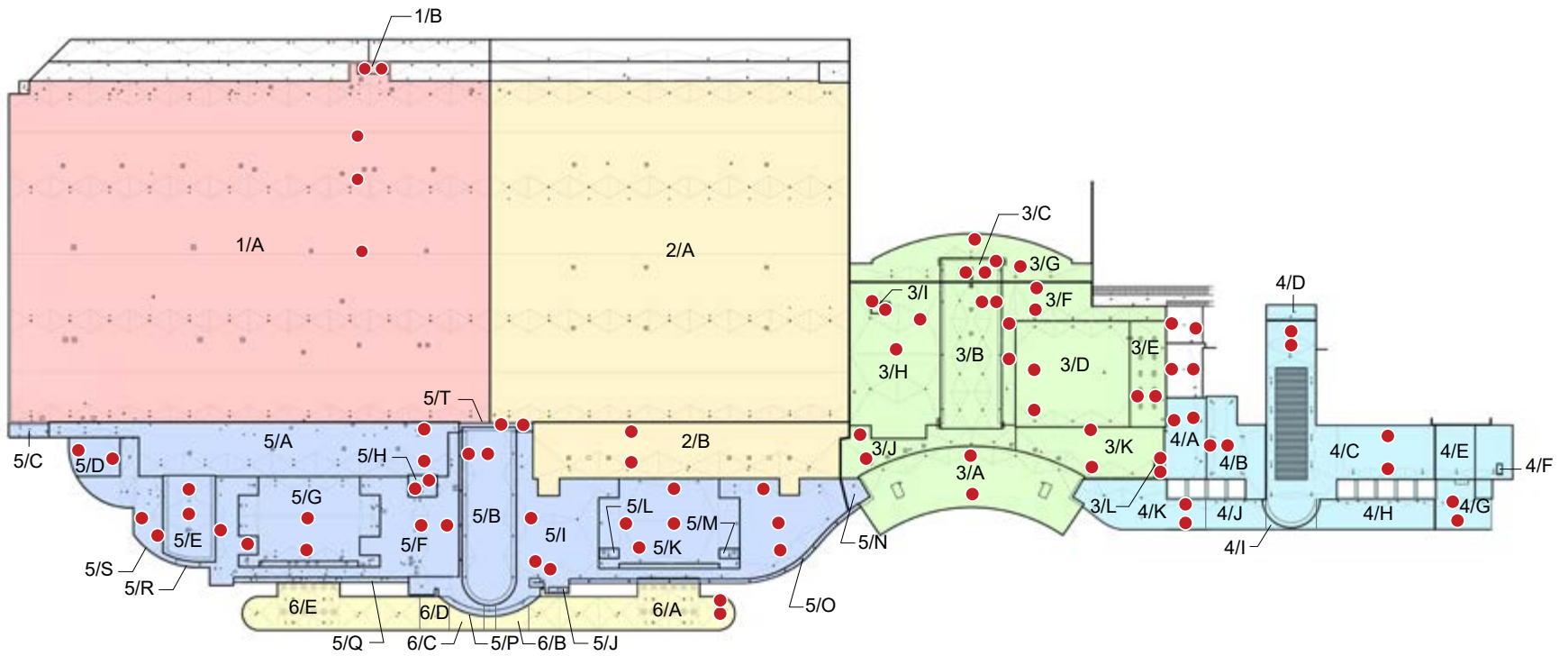
(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION

Roof Cut Locations



● Click roof cut tags To access roof cut data



Roof Cut No.: 1

Roof: 1-A

Roofing Materials: 1. Single-Ply
2. 2" ISO [R-11.12]

Existing R-Value: R-11.12

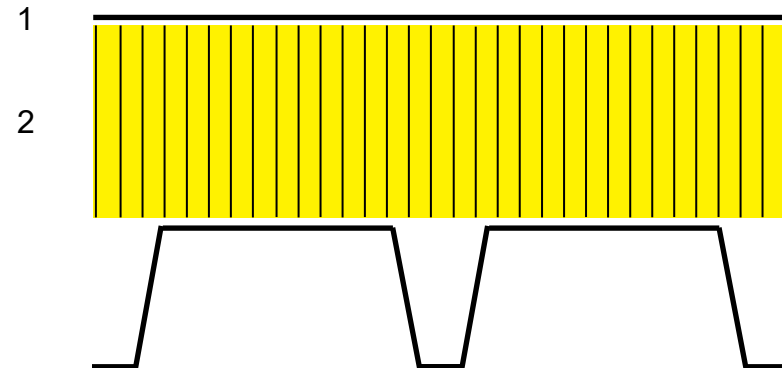
Deck: Acoustic Metal Deck

Recommendations: Remove:
- Single-Ply (1)

Existing to Remain:
- 2" ISO (2) [R-11.12]

Add New:
- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 2

Roof: 1-A

Roofing Materials: 1. Single-Ply
2. 2" ISO [R-11.12]

Existing R-Value: R-11.12

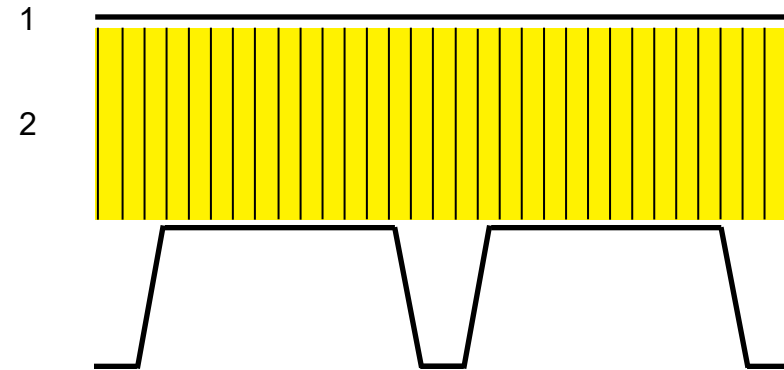
Deck: Acoustic Metal Deck

Recommendations: Remove:
- Single-Ply (1)

Existing to Remain:
- 2" ISO (2) [R-11.12]

Add New:
- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 3

Roof: 1-A

Roofing Materials: 1. Single-Ply
2. 2" ISO [R-11.12]

Existing R-Value: R-11.12

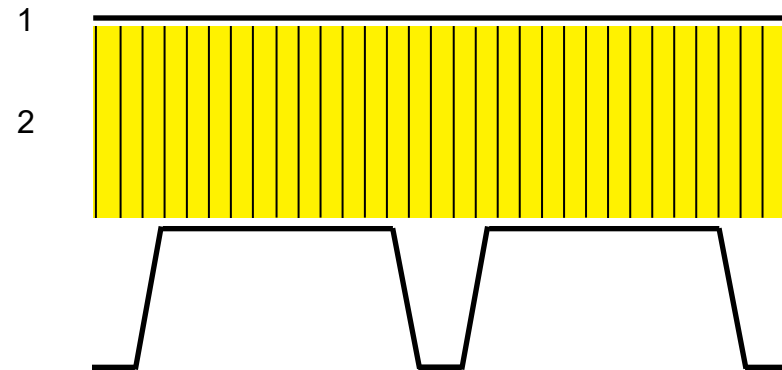
Deck: Metal Deck

Recommendations: Remove:
- Single-Ply (1)

Existing to Remain:
- 2" ISO (2) [R-11.12]

Add New:
- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 4

Roof: 1-B

Roofing Materials:

1. Single-Ply
2. 2" ISO [R-11.12]
3. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

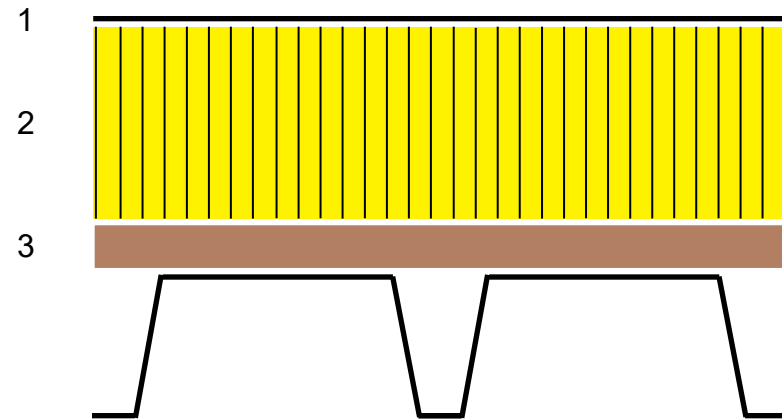
Existing to Remain:

- 2" ISO (2) [R-11.12]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 5

Roof: 1-B

Roofing Materials:

1. Single-Ply
2. 2" ISO [R-11.12]
3. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

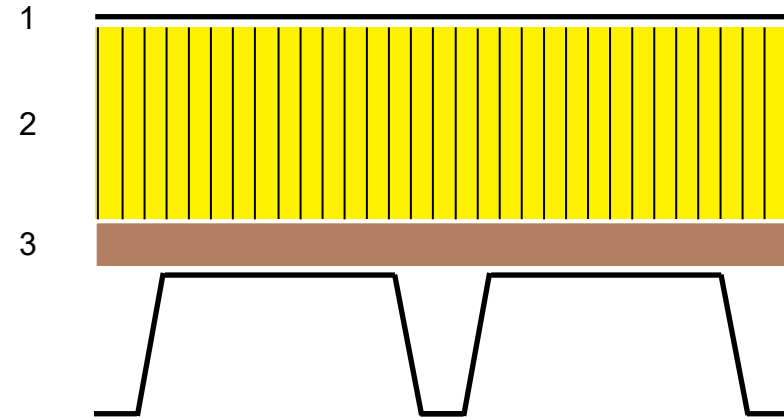
Existing to Remain:

- 2" ISO (2) [R-11.12]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 6

Roof: 5-A

Roofing Materials:

1. Single-Ply
2. 4" (2 1/2" + 1 1/2") ISO [R-22.24]
3. 1/2" Dens Deck

Existing R-Value: R-22.24

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

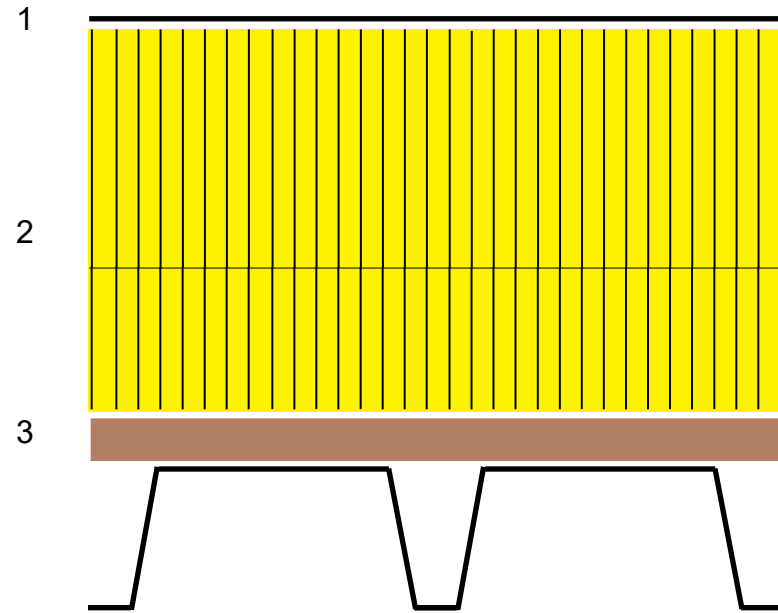
Existing to Remain:

- 4" ISO (2) [R-22.24]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-33.36



Roof Cut No.: 7

Roof: 5-A

Roofing Materials:

1. Single-Ply
2. 2" ISO [R-11.12]
3. 1/2" Dens. Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

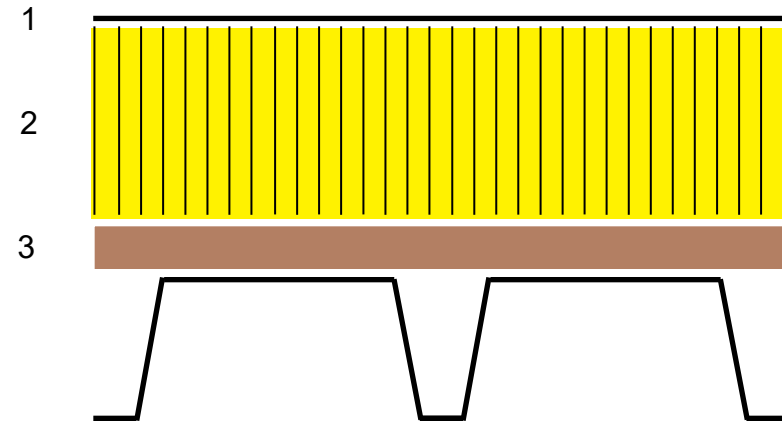
Existing to Remain:

- 2" ISO (2) [R-11.12]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 8

Roof: 5-H

Roofing Materials:

1. Single-Ply
2. 4" ISO (2" + 2") [R-22.24]

Existing R-Value: R-22.24

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

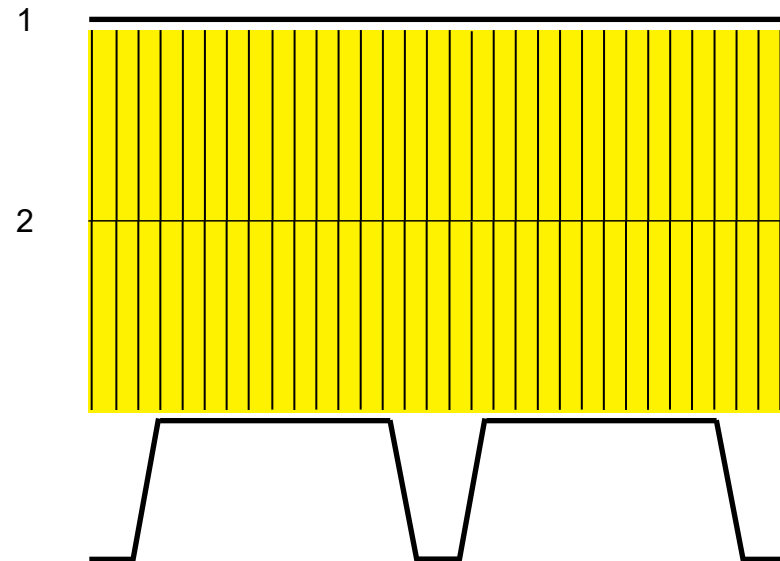
Existing to Remain:

- 4" ISO (2) [R-22.24]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-33.36



Roof Cut No.: 9

Roof: 5-H

Roofing Materials:
1. Single-Ply
2. 2 1/2" ISO [R-13.90]

Existing R-Value: R-13.90

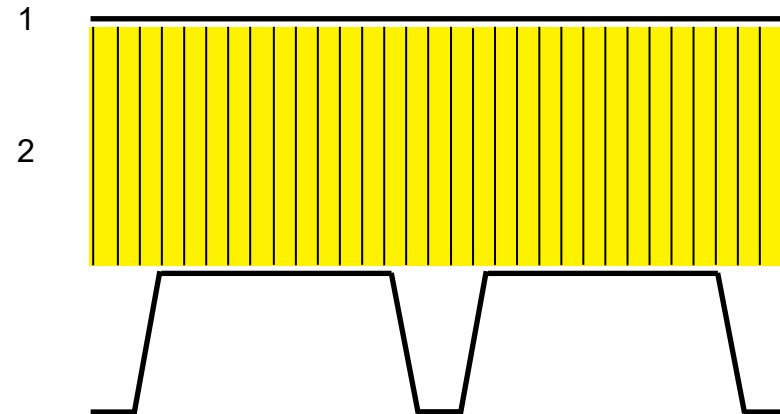
Deck: Metal Deck

Recommendations:
Remove:
- Single-Ply (1)

Existing to Remain:
- 2 1/2" ISO (2) [R-13.90]

Add New:
- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-25.02



Roof Cut No.: 10

Roof: 5-E

Roofing Materials: 1. Single-Ply
2. 2" ISO [R-11.12]

Existing R-Value: R-11.12

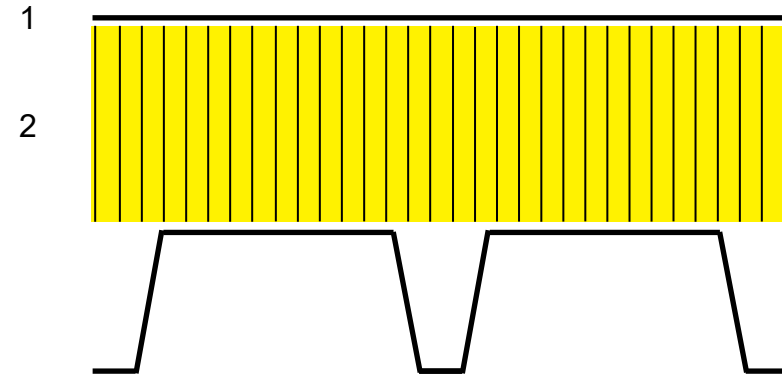
Deck: Metal Deck

Recommendations: Remove:
- Single-Ply (1)

Existing to Remain:
- 2" ISO (2) [R-11.12]

Add New:
- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 11

Roof: 5-E

Roofing Materials:
1. Single-Ply
2. 2" ISO [R-11.12]

Existing R-Value: R-11.12

Deck: Metal Deck

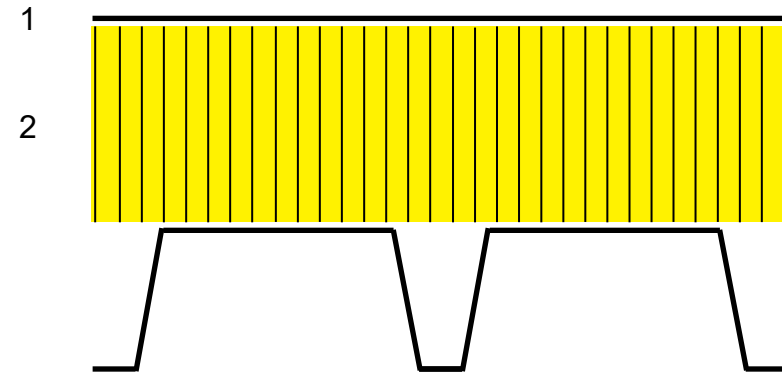
Recommendations:

- Remove:
 - Single-Ply (1)

- Existing to Remain:
 - 2" ISO (2) [R-11.12]

- Add New:
 - 2" ISO [R-11.12]
 - 1/2" Cover Board
 - 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 12

Roof: 5-B

Roofing Materials:

1. Single-Ply
2. 2" ISO [R-11.12]
3. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

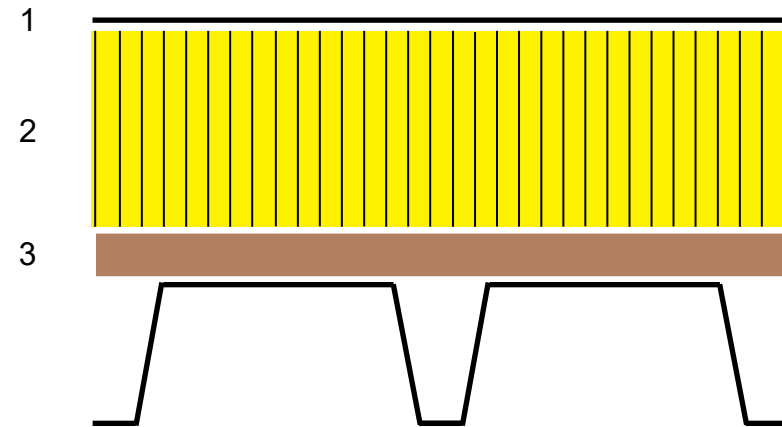
Existing to Remain:

- 2" ISO (2) [R-11.12]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 13

Roof: 5-B

Roofing Materials:

1. Single-Ply
2. 2" ISO [R-11.12]
3. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

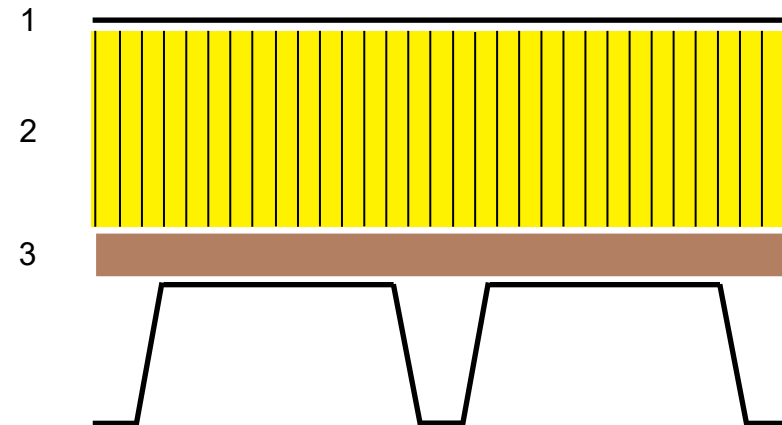
Existing to Remain:

- 2" ISO (2) [R-11.12]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 14

Roof: 2-B

Roofing Materials:

1. Single-Ply
2. 2" ISO [R-11.12]
3. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

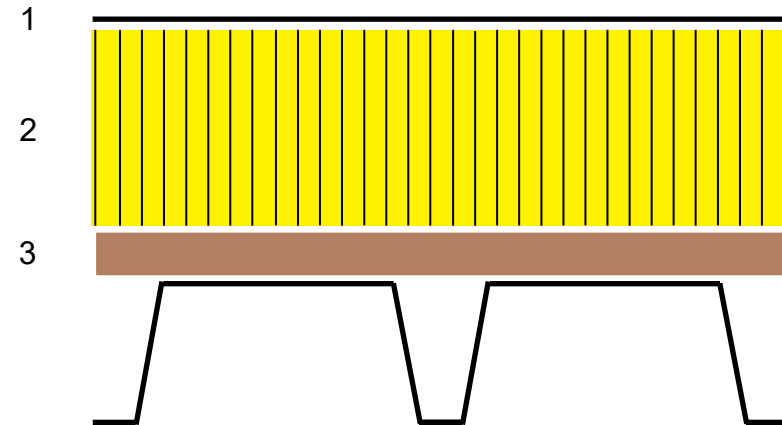
Existing to Remain:

- 2" ISO (2) [R-11.12]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 15

Roof: 2-B

Roofing Materials:

1. Single-Ply
2. 2" ISO [R-11.12]
3. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

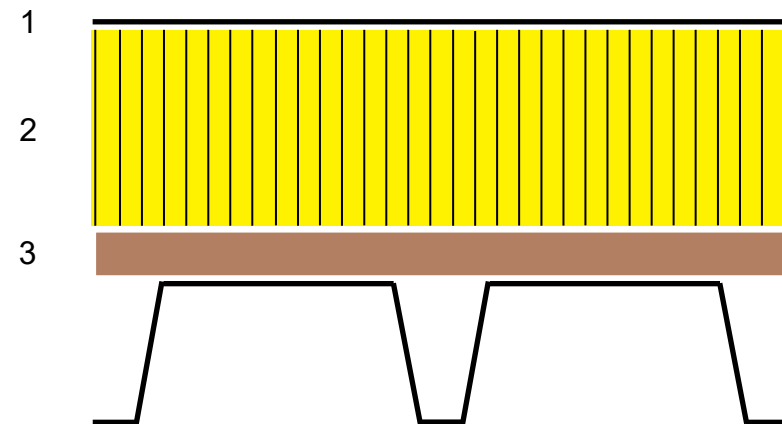
Existing to Remain:

- 2" ISO (2) [R-11.12]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 16

Roof: 5-F

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

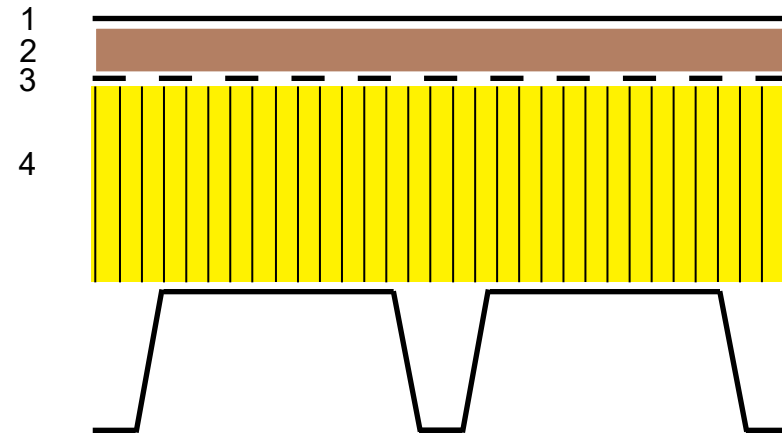
Existing to Remain:

- 2" ISO (4) [R-11.12]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 17

Roof: 5-F

Roofing Materials:

1. Mod Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO
5. 1/2" Dens Deck

Existing R-Value: **R-11.12**

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

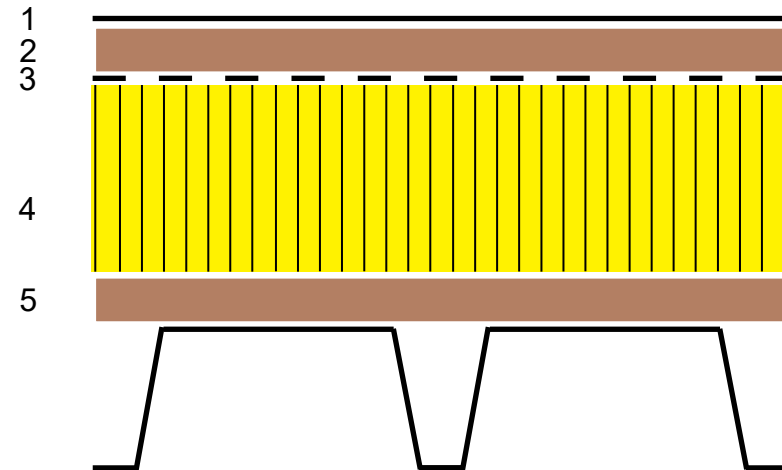
Existing to Remain:

- 2" ISO (4) [**R-11.12**]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [**R-11.12**]
- 1/2" Cover Board
- 60 Mil. Single-Ply [**SRI-80+**]

New R-Value: **R-22.24**



Roof Cut No.: 18

Roof: 5-F

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2 1/2" (1/2" + 2") ISO
[R-13.90]

Existing R-Value: **R-13.90**

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

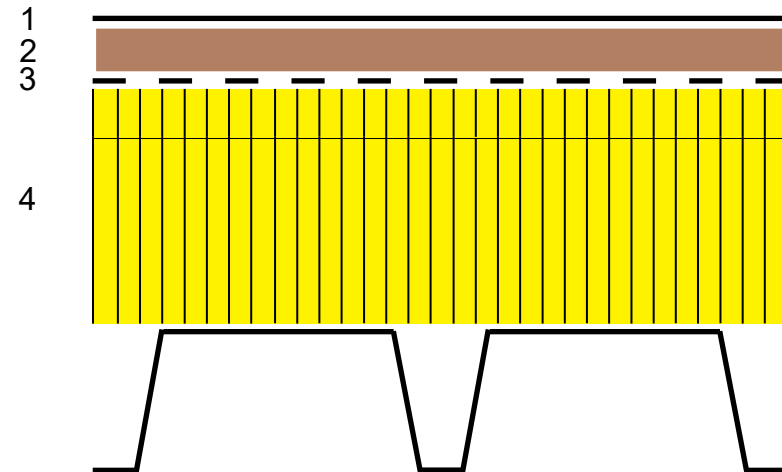
Existing to Remain:

- 2 1/2" ISO (4) [R-13.90]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: **R-25.02**



Roof Cut No.: 19

Roof: 5-F

Roofing Materials:

1. Mod Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

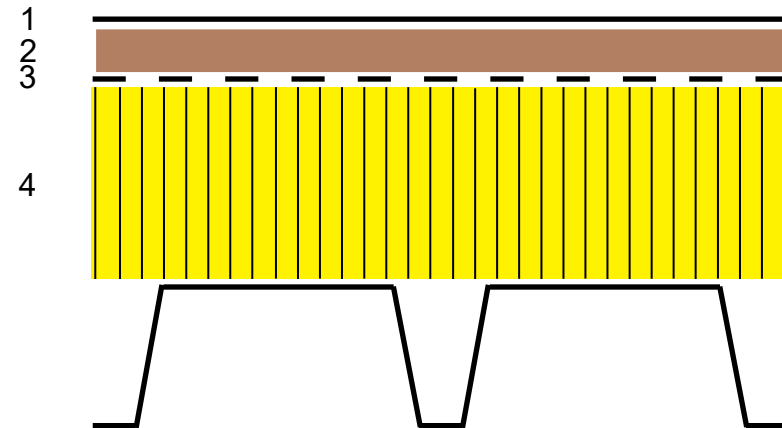
Existing to Remain:

- 2" ISO (4) [R-11.12]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 20

Roof: 5-S

Roofing Materials:

1. Mod Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 3" (1 1/2" + 1 1/2") ISO
[R-16.68]

Existing R-Value: R-16.68

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

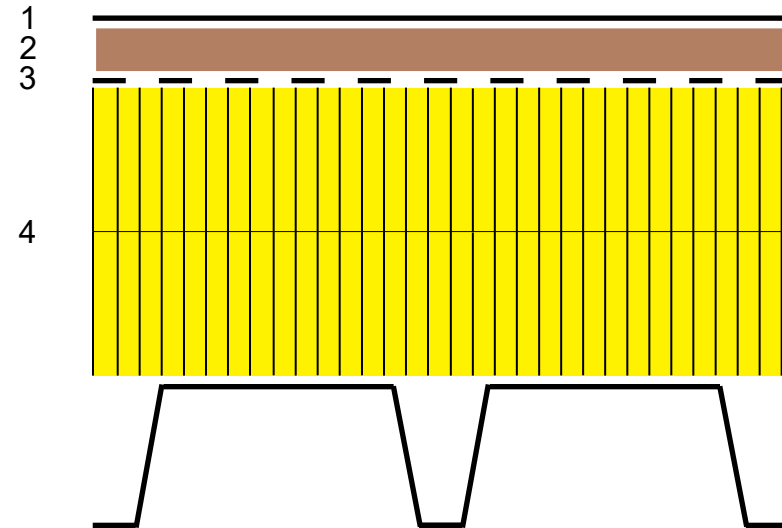
Existing to Remain:

- 3" ISO (4) [R-16.68]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-27.80



Roof Cut No.: 21

Roof: 5-S

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

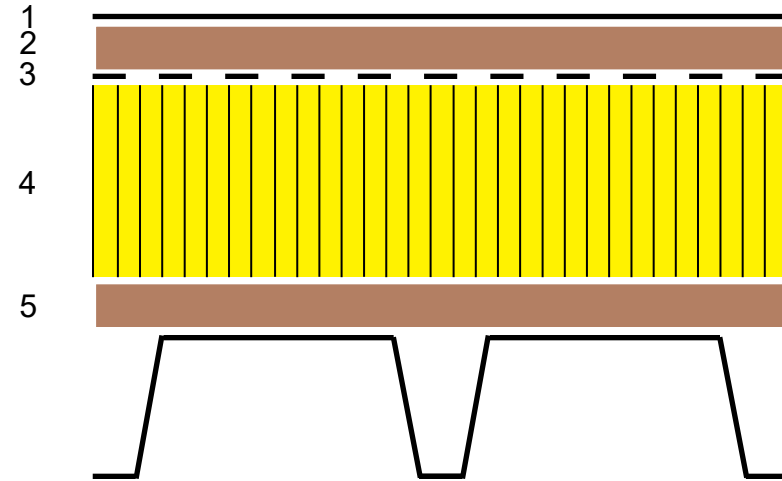
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 22

Roof: 5-l

Roofing Materials:

1. Mod Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

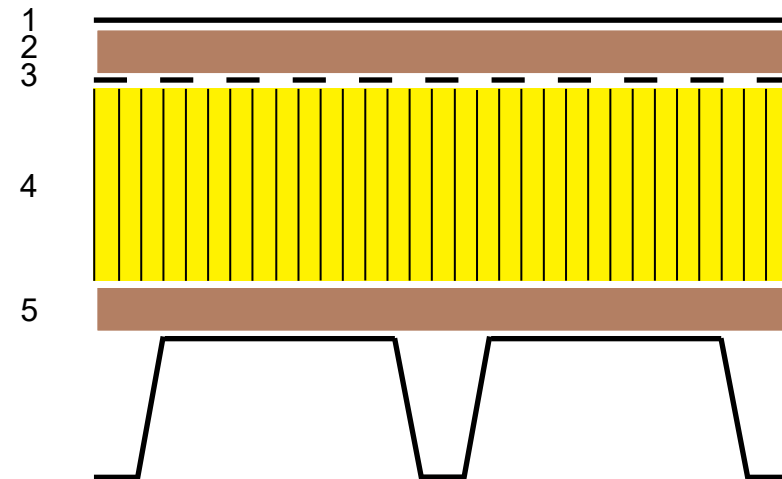
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 23

Roof: 5-I

Roofing Materials:

1. Mod Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 4" (1 1/2" + 2 1/2") ISO [R-22.24]
5. 1/2" Dens Deck

Existing R-Value: R-22.24

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

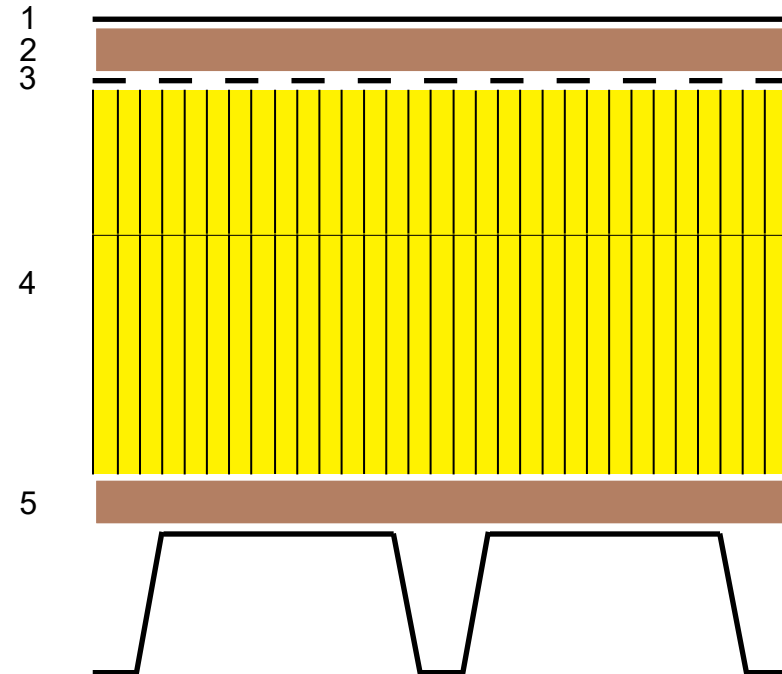
Existing to Remain:

- 4" ISO (4) [R-22.24]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-33.36



Roof Cut No.: 24

Roof: 5-l

Roofing Materials:

1. Mod Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" (1/2" + 1 1/2") ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: **R-11.12**

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

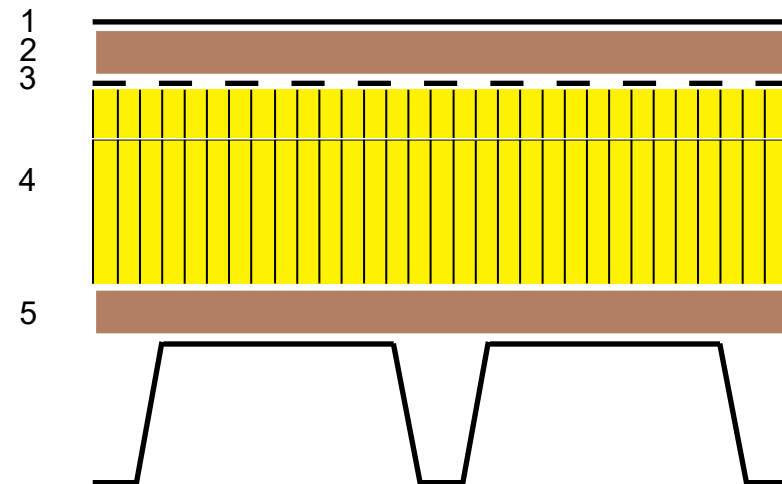
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: **R-22.24**



Roof Cut No.: 25

Roof: 5-l

Roofing Materials:

1. Mod Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2 1/2" ISO [R-13.90]
5. 1/2" Dens Deck

Existing R-Value: **R-13.90**

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

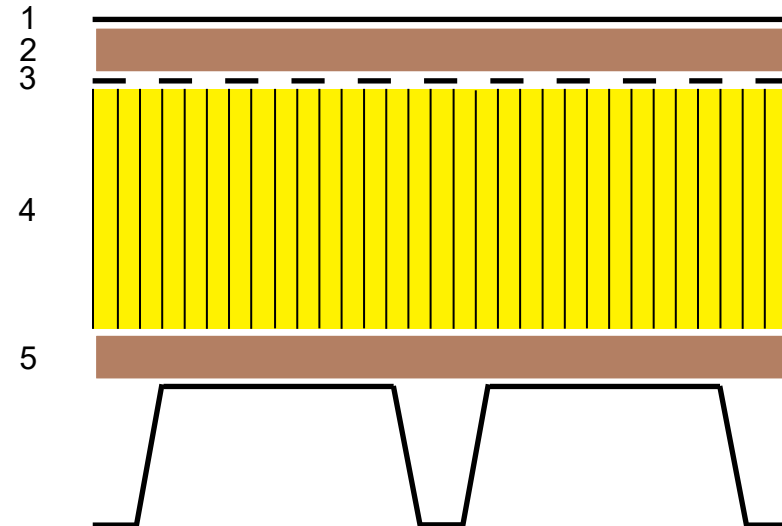
Existing to Remain:

- 2 1/2" ISO (4) [R-13.90]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: **R-25.02**



Roof Cut No.: 26

Roof: 5-l

Roofing Materials:

1. Mod Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 1 1/2" ISO [R-8.34]
5. 1/2" Dens Deck

Existing R-Value: **R-8.34**

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

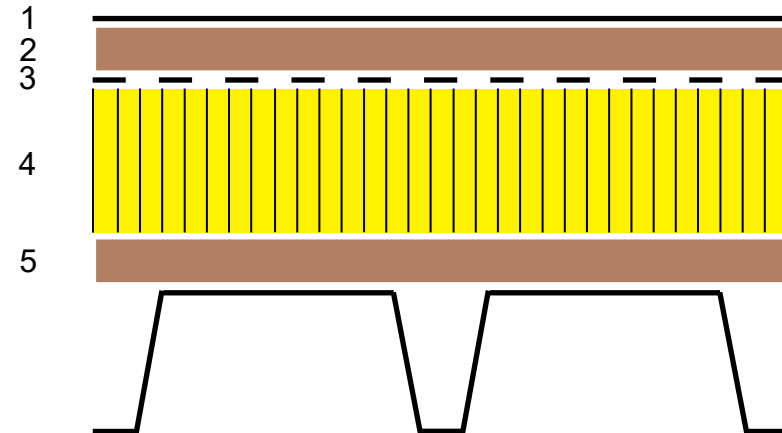
Existing to Remain:

- 1 1/2" ISO (4) [R-8.34]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: **R-19.46**



Roof Cut No.: 27

Roof: 5-l

Roofing Materials:

1. Mod Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 1 3/4" ISO [R-9.73]
5. 1/2" Dens Deck

Existing R-Value: R-9.73

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

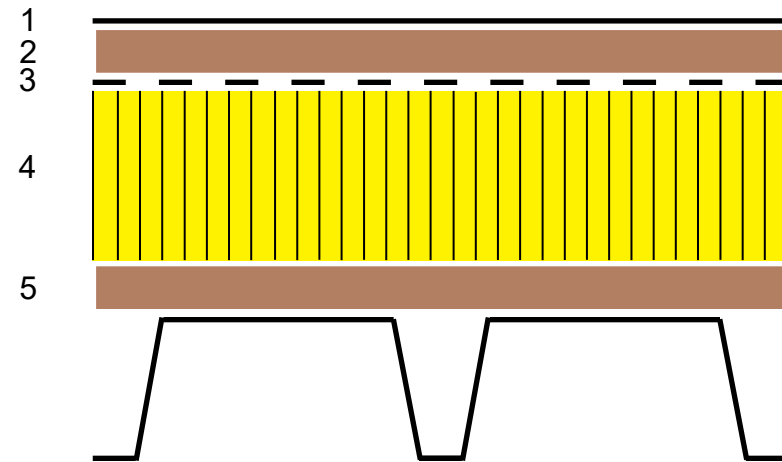
Existing to Remain:

- 1 3/4" ISO (4) [R-9.73]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-20.85



Roof Cut No.: 28

Roof: 5-D

Roofing Materials:

- 1. Single-Ply
- 2. 2" ISO [R-11.12]

Existing R-Value: R-11.12

Deck: Concrete Deck

Recommendations:

Remove:

- Single-Ply (1)

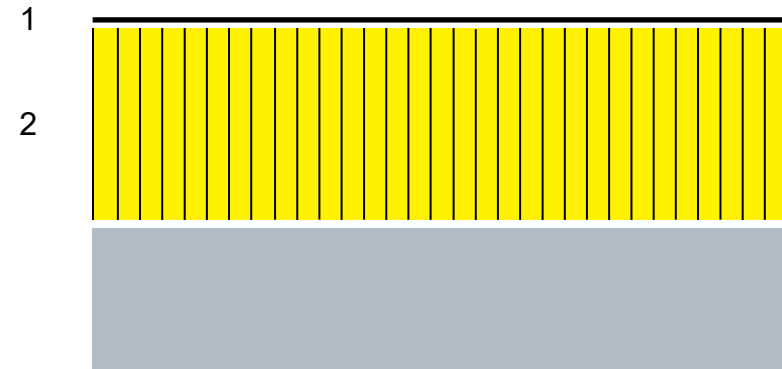
Existing to Remain:

- 2" ISO (2) [R-11.12]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 29

Roof: 5-D

Roofing Materials:

1. Single-Ply
2. 2" ISO [R-11.12]

Existing R-Value: R-11.12

Deck: Concrete Deck

Recommendations:

Remove:

- Single-Ply (1)

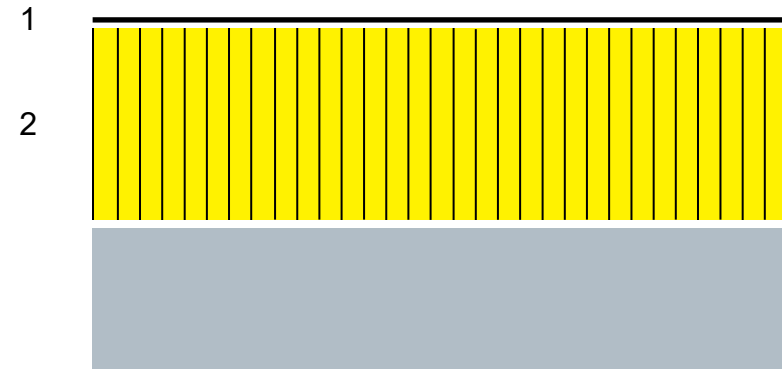
Existing to Remain:

- 2" ISO (2) [R-11.12]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 30

Roof: 5-G

Roofing Materials:

1. Single-Ply
2. 2" ISO [R-11.12]

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

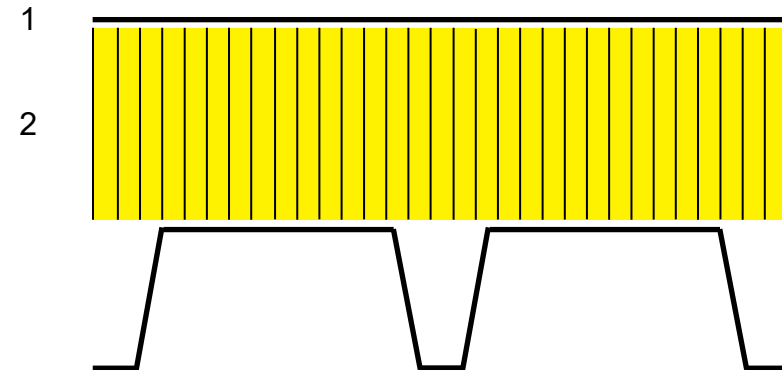
Existing to Remain:

- 2" ISO (2) [R-11.12]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 31

Roof: 5-G

Roofing Materials:

1. Single-Ply
2. 1 1/2" ISO
3. Dens Deck

Existing R-Value: **R-8.34**

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

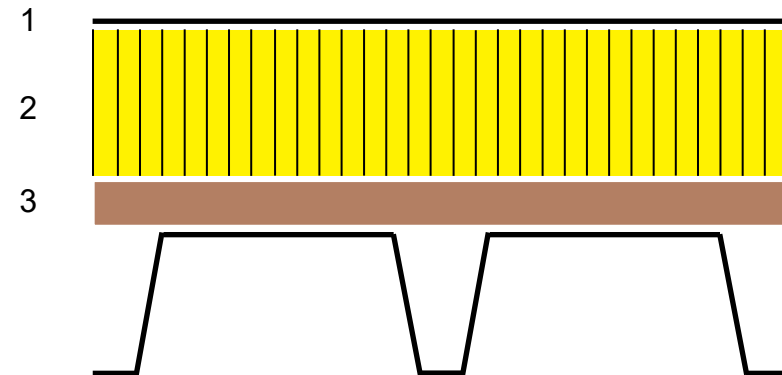
Existing to Remain:

- 1 1/2" ISO (2) **[R-8.34]**
- Dens Deck (3)

Add New:

- 2" ISO **[R-11.12]**
- 1/2" Cover Board
- 60 Mil. Single-Ply **[SRI-80+]**

New R-Value: **R-19.46**



Roof Cut No.: 32

Roof: 5-K

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

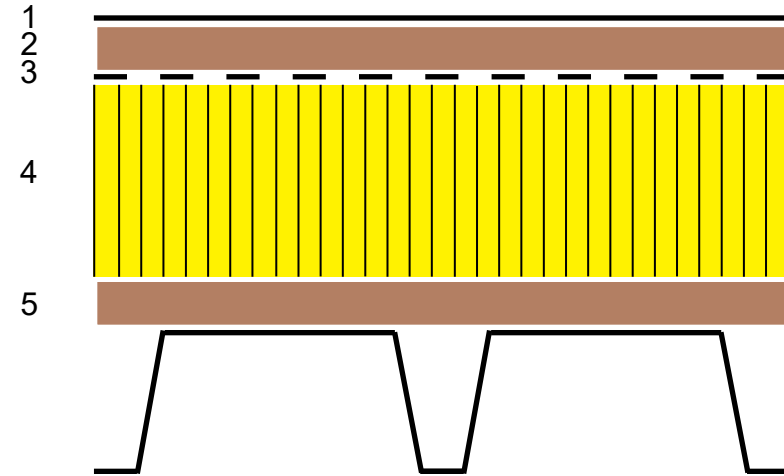
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 33

Roof: 5-K

Roofing Materials:

1. Mod Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 4" (2" + 2") ISO [R-22.24]
5. 1/2" Dens Deck

Existing R-Value: R-22.24

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

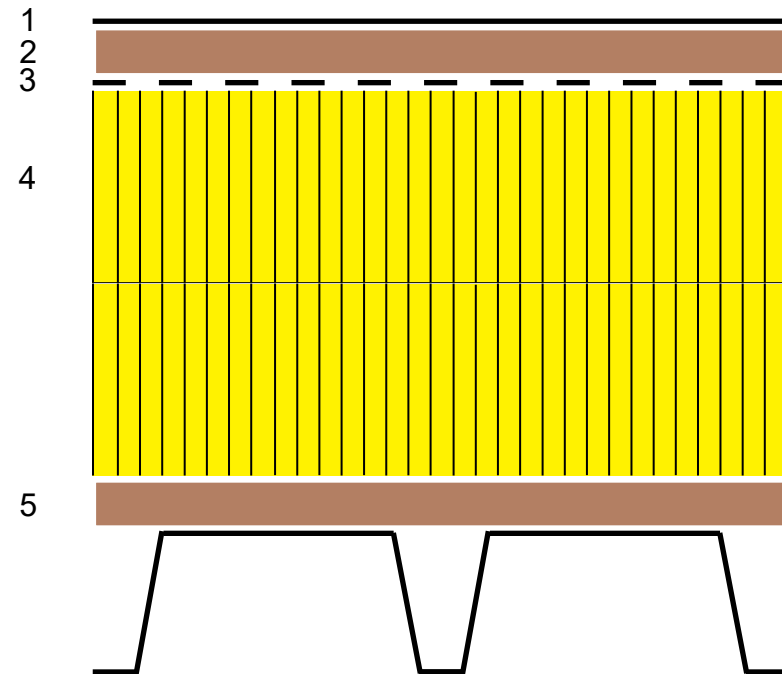
Existing to Remain:

- 4" ISO (4) [R-22.24]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-33.36



Roof Cut No.: 34

Roof: 5-K

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

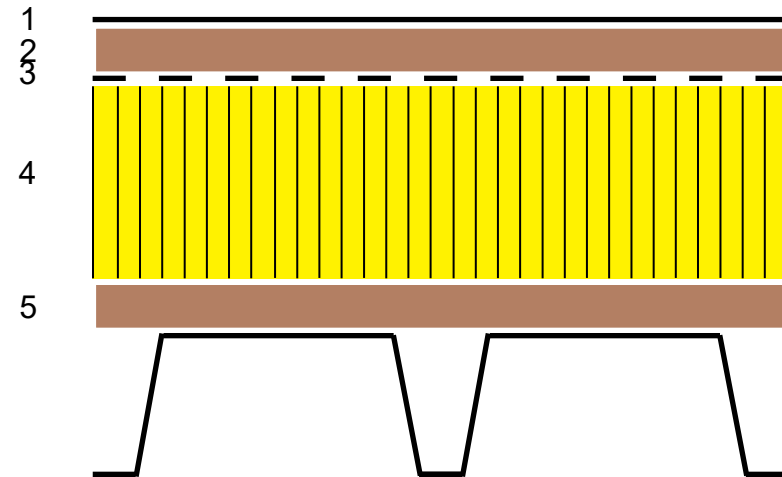
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 35

Roof: 5-K

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 4" (2" + 2") ISO [R-22.24]
5. 1/2" Dens Deck

Existing R-Value: **R-22.24**

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

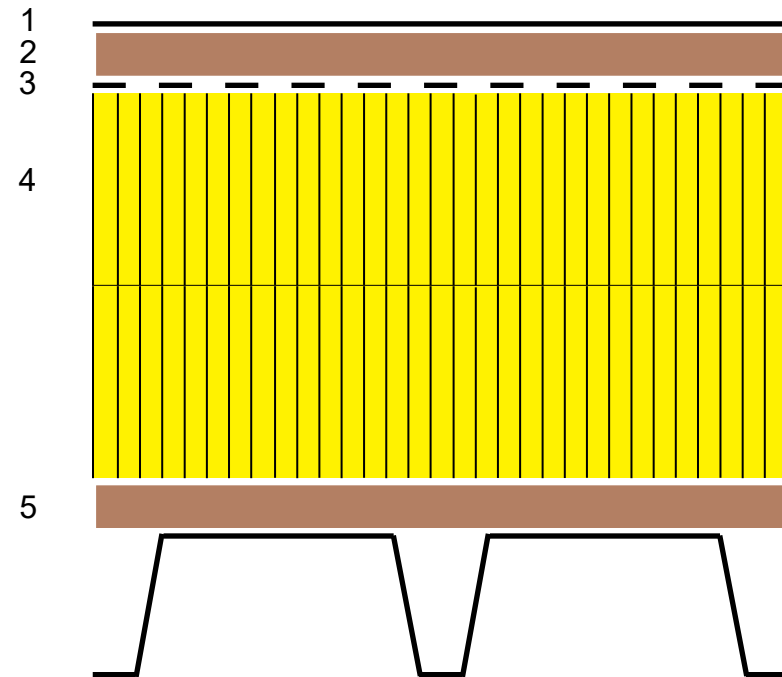
Existing to Remain:

- 4" ISO (4) [R-22.24]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: **R-33.36**



Roof Cut No.: 36

Roof: 5-T

Roofing Materials:

1. Single-Ply
2. 3 1/2" (1 1/2" + 2") ISO [R-19.46]
3. 1/2" Dens Deck

Existing R-Value: R-19.46

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

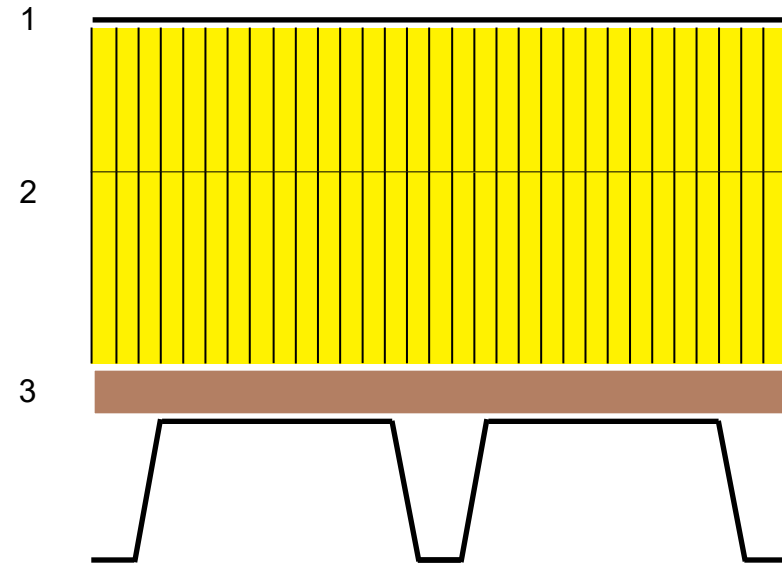
Existing to Remain:

- 3 1/2" ISO (2) [R-19.46]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-30.58



Roof Cut No.: 37

Roof: 5-T

Roofing Materials:

1. Single-Ply
2. 2" ISO [R-11.12]
3. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

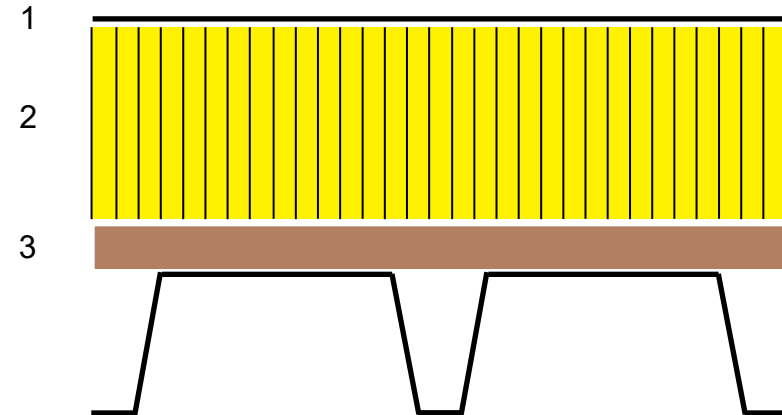
Existing to Remain:

- 2" ISO (2) [R-11.12]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 38

Roof: 3-J

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: **R-11.12**

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

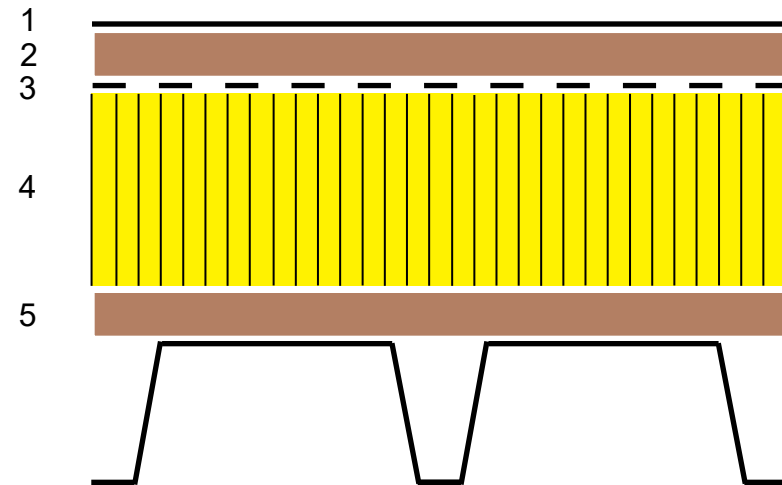
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: **R-22.24**



Roof Cut No.: 39

Roof: 3-J

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

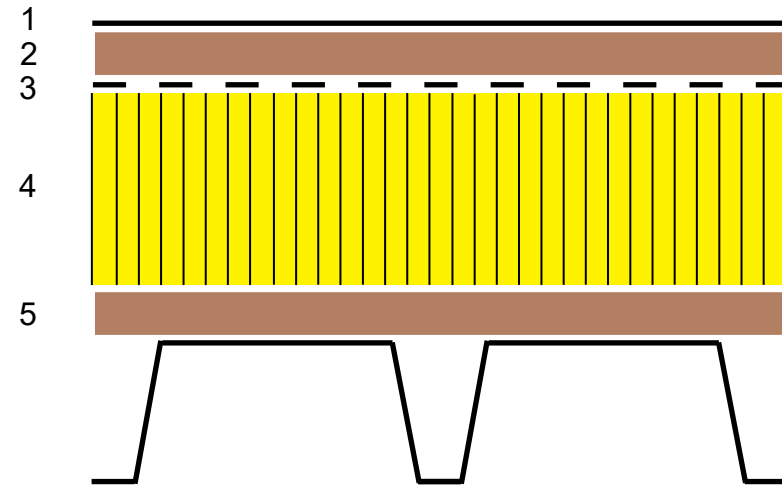
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 40

Roof: 3-A

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

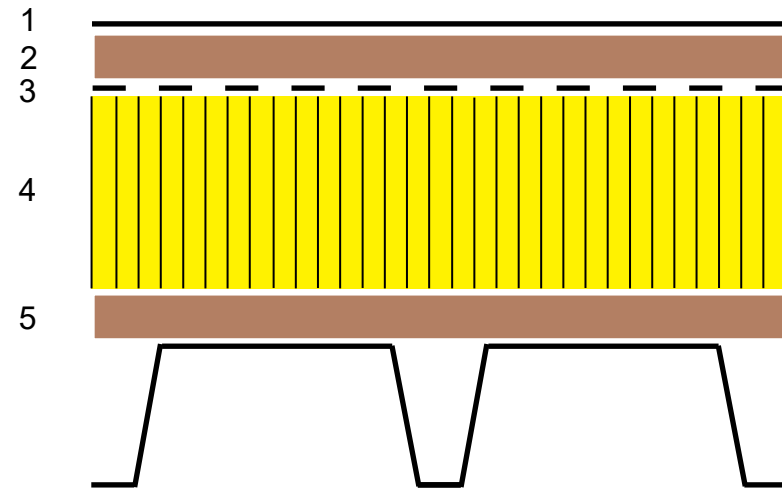
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 41

Roof: 3-A

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

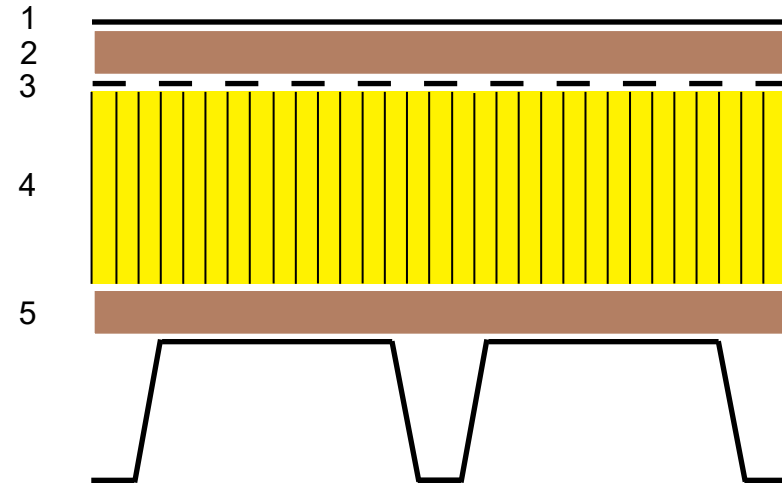
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 42

Roof: 3-K

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Concrete Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

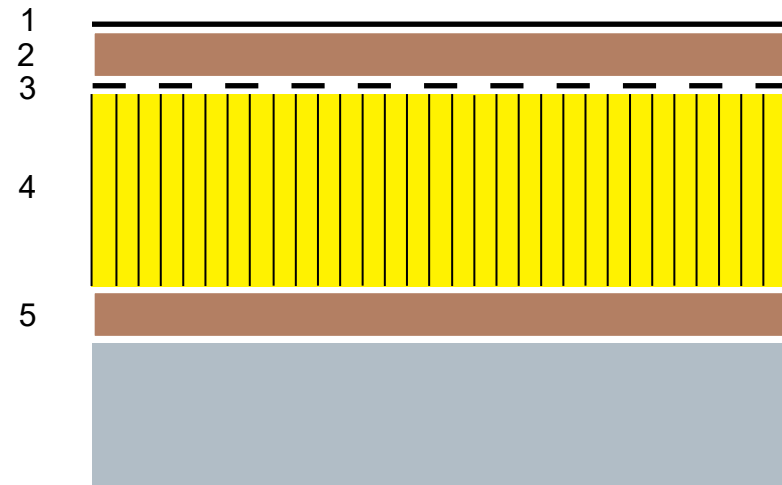
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 43

Roof: 3-K

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

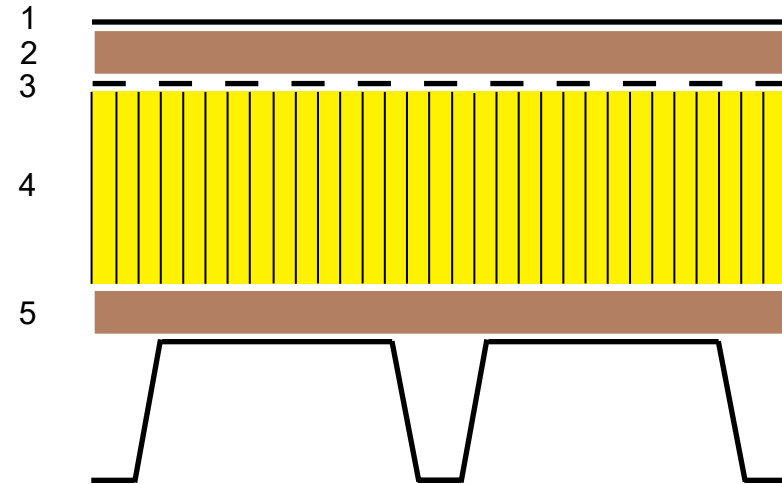
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 44

Roof: 3-L

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

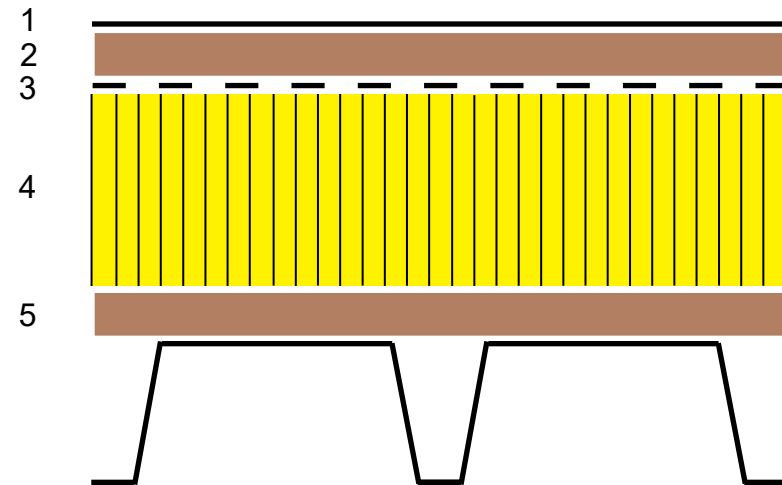
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 45

Roof: 3-L

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

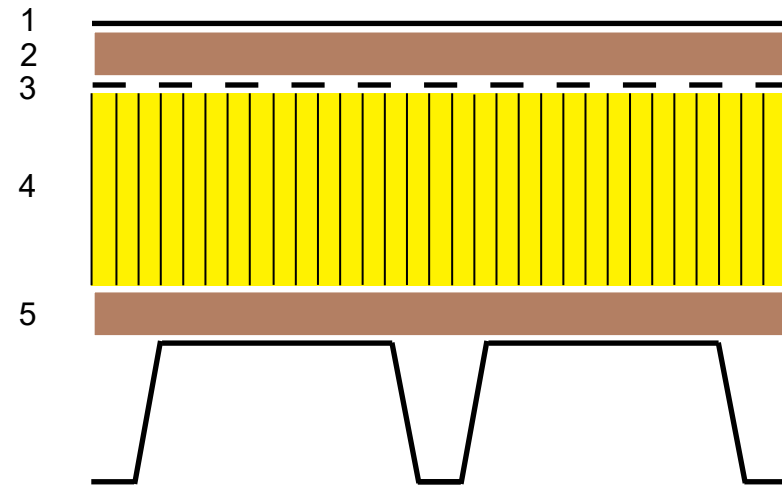
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 46

Roof: 3-F

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

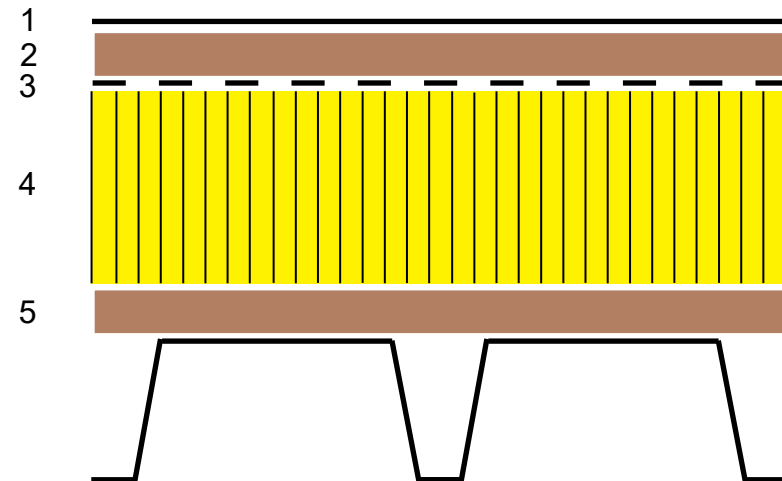
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 47

Roof: 3-F

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

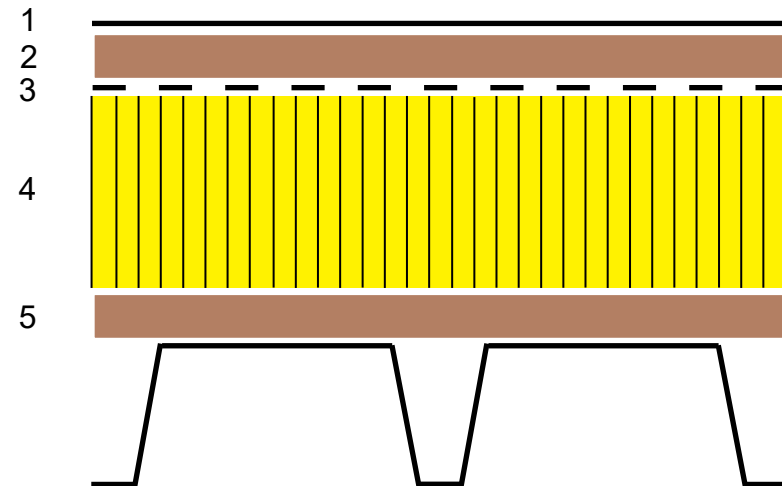
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 48

Roof: 3-F

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 3" (1" + 2") ISO [R-16.68]
5. 1/2" Dens Deck

Existing R-Value: **R-16.68**

Deck: Concrete Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

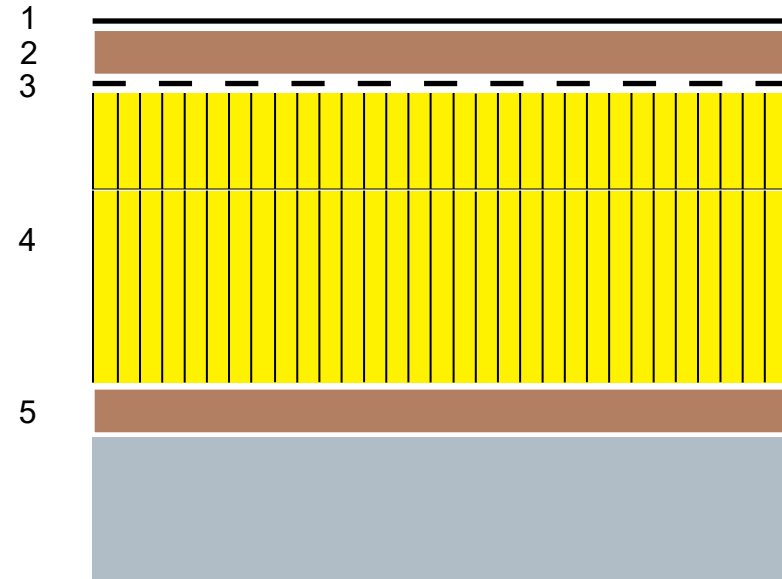
Existing to Remain:

- 3" ISO (4) [R-16.68]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: **R-27.80**



Roof Cut No.: 49

Roof: 3-F

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 6" (2" + 2" + 2") ISO
[R-33.36]
5. 1/2" Dens Deck

Existing R-Value: **R-33.36**

Deck: Concrete Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

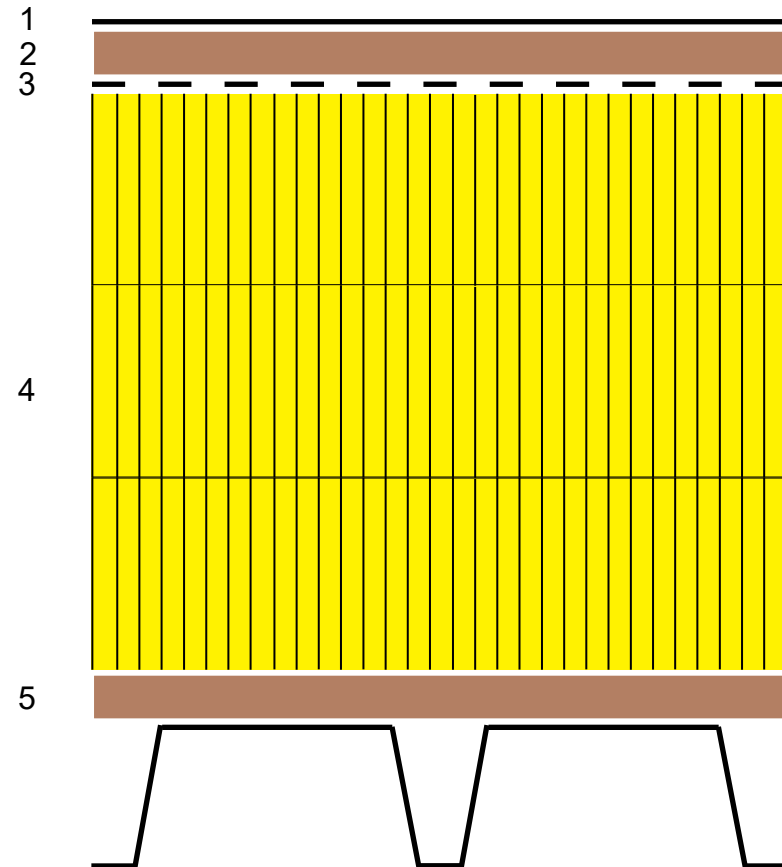
Existing to Remain:

- 6" ISO (4) [R-33.36]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: **R-44.48**



Roof Cut No.: 50

Roof: 3-G

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 1" ISO [R-5.56]
5. 1/2" Dens Deck

Existing R-Value: R-5.56

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

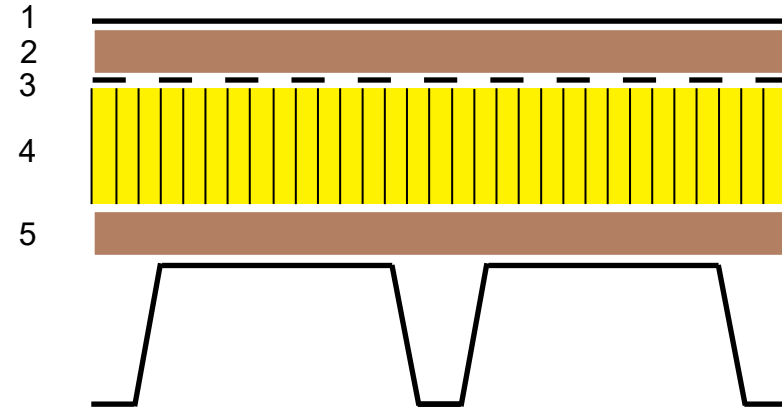
Existing to Remain:

- 1" ISO (4) [R-5.56]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-16.68



Roof Cut No.: 51

Roof: 3-G

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 1" ISO [R-5.56]
5. 1/2" Dens Deck

Existing R-Value: R-5.56

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

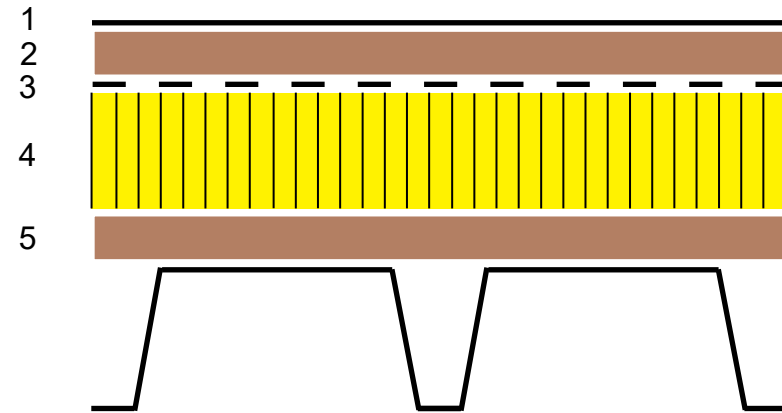
Existing to Remain:

- 1" ISO (4) [R-5.56]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-16.68



Roof Cut No.: 52

Roof: 3-H

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

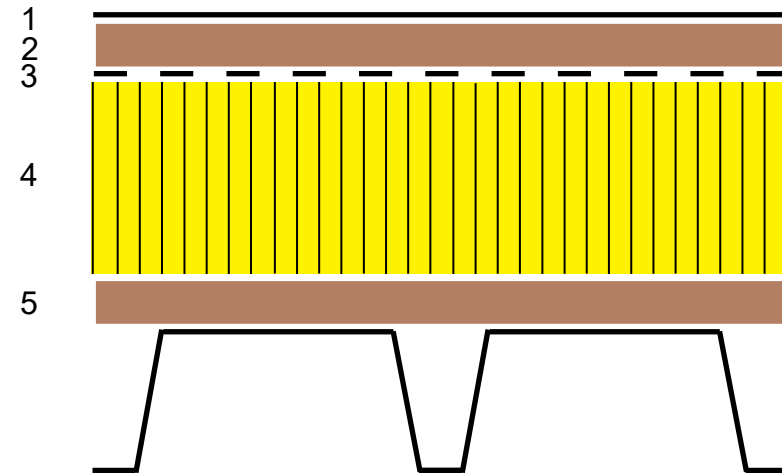
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 53

Roof: 3-H

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

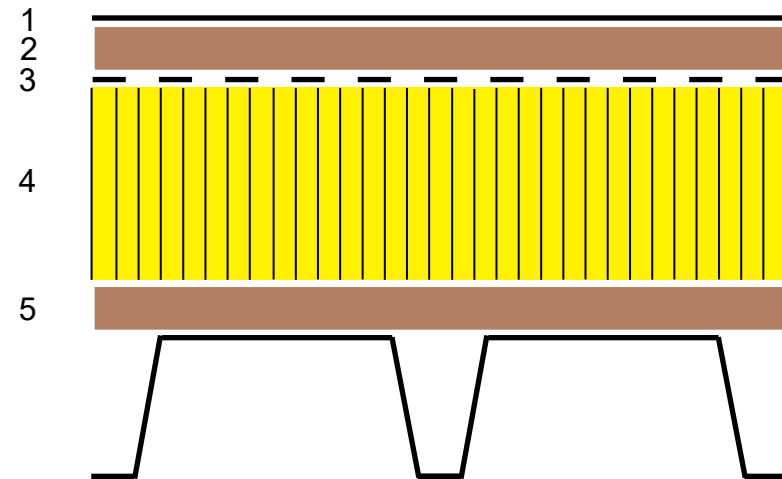
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 54

Roof: 3-l

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 1" ISO [R-5.56]
5. 1/2" Dens Deck

Existing R-Value: R-5.56

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

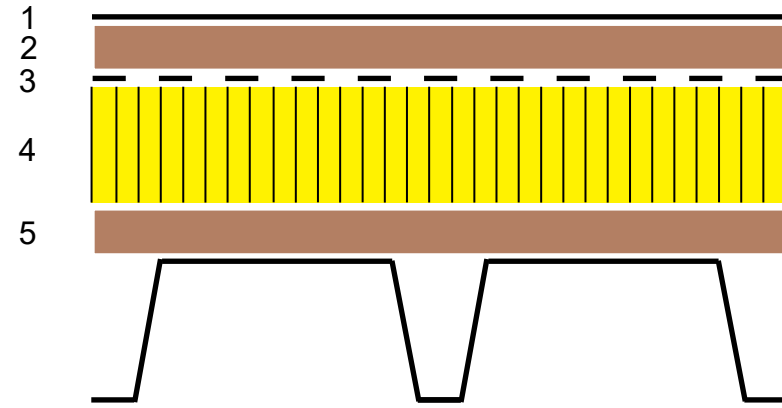
Existing to Remain:

- 1" ISO (4) [R-5.56]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-16.68



Roof Cut No.: 55

Roof: 3-I

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 4" (1" + 3") ISO [R-22.24]
5. 1/2" Dens Deck

Existing R-Value: R-22.24

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

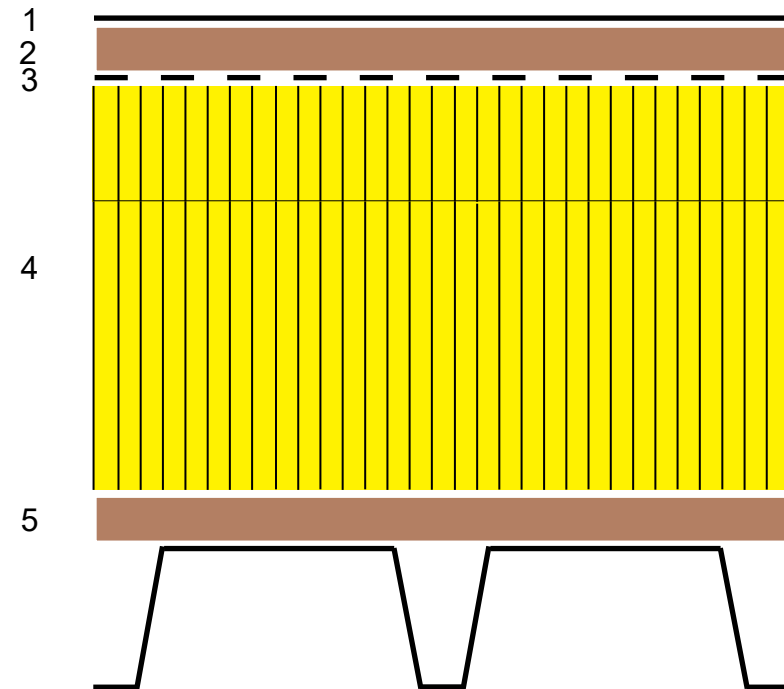
Existing to Remain:

- 4" ISO (4) [R-22.24]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-33.36



Roof Cut No.: 56

Roof: 3-C

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 1 1/2" ISO [R-8.34]
5. 1/2" Dens Deck

Existing R-Value: R-8.34

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

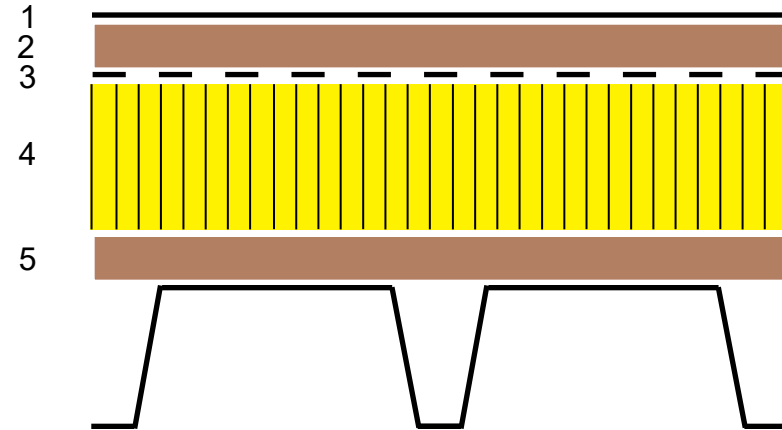
Existing to Remain:

- 1 1/2" ISO (4) [R-8.34]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-19.46



Roof Cut No.: 57

Roof: 3-C

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

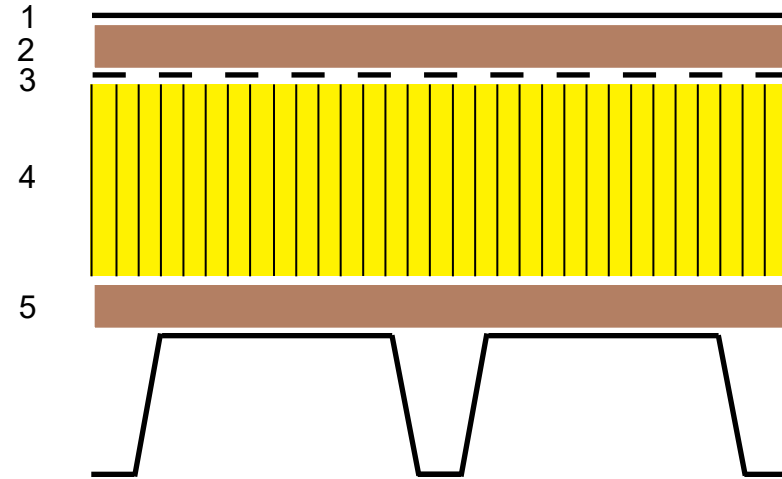
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 58

Roof: 3-C

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

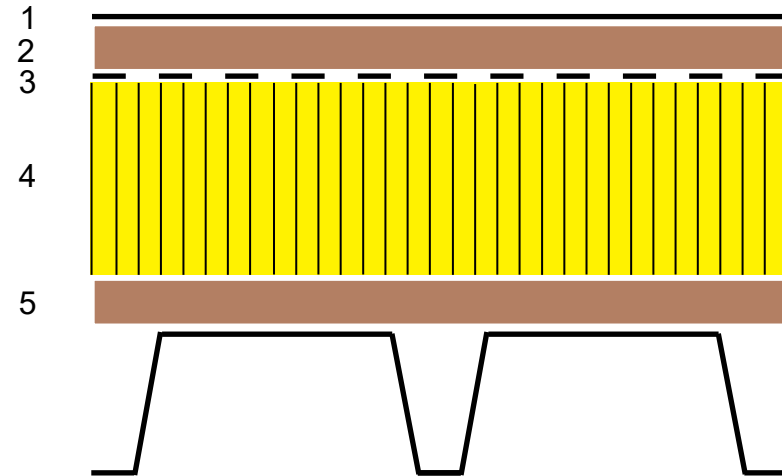
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 59

Roof: 3-B

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

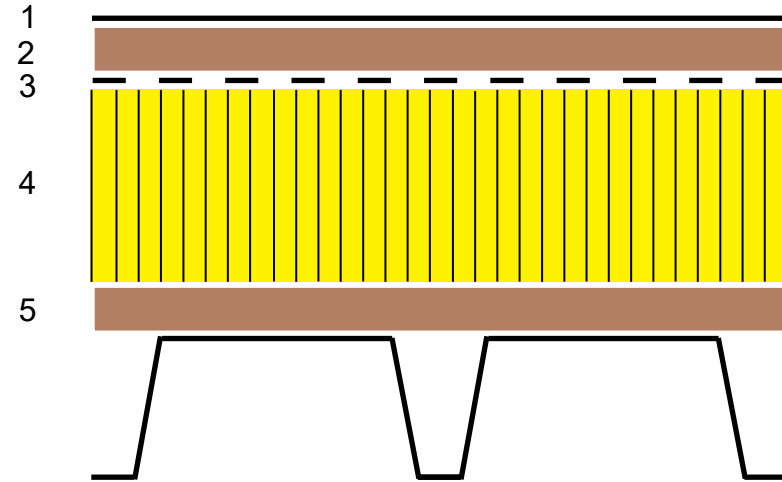
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 60

Roof: 3-B

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]
5. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

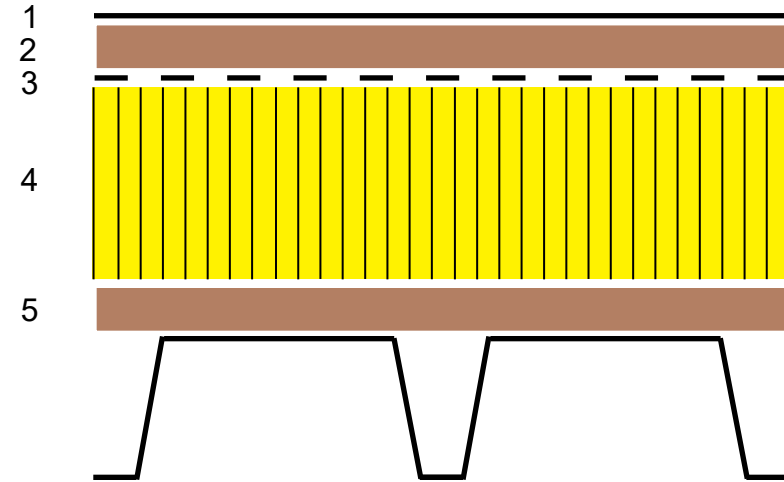
Existing to Remain:

- 2" ISO (4) [R-11.12]
- 1/2" Dens Deck (5)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 61

Roof: 4-A

Roofing Materials:

1. 1" Granular Surface Foam
2. Single-Ply
3. 2" ISO [R-11.12]
4. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Single-Ply (2)

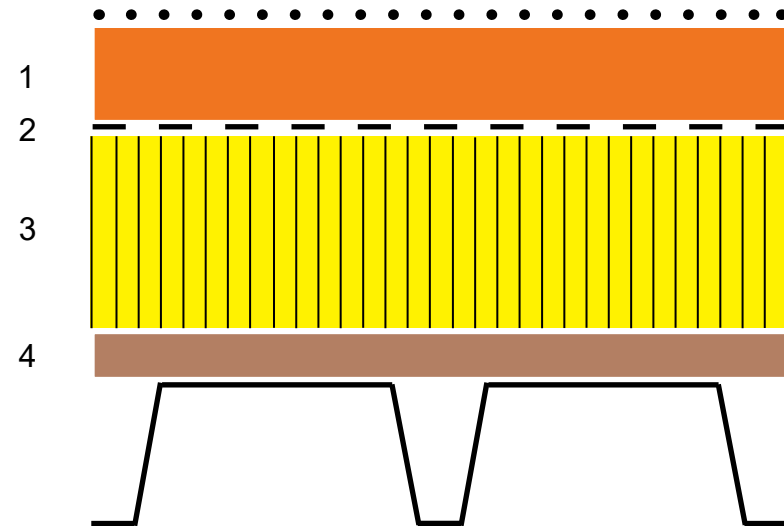
Existing to Remain:

- 2" ISO (3) [R-11.12]
- 1/2" Dens Deck (4)

Add New:

- 3" ISO [R-16.68]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-27.80



Roof Cut No.: 62

Roof: 4-A

Roofing Materials:

1. 2 1/2" Granular Surface Foam
2. Single-Ply
3. 1" ISO [R-5.56]
4. 1/2" Dens Deck

Existing R-Value: R-5.56

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Single-Ply (2)

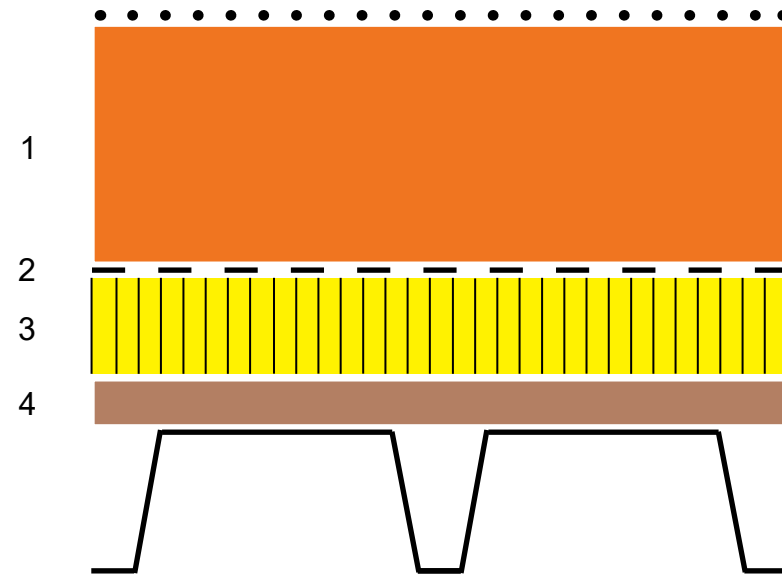
Existing to Remain:

- 1" ISO (3) [R-5.56]
- 1/2" Dens Deck (4)

Add New:

- 3" ISO [R-16.68]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 63

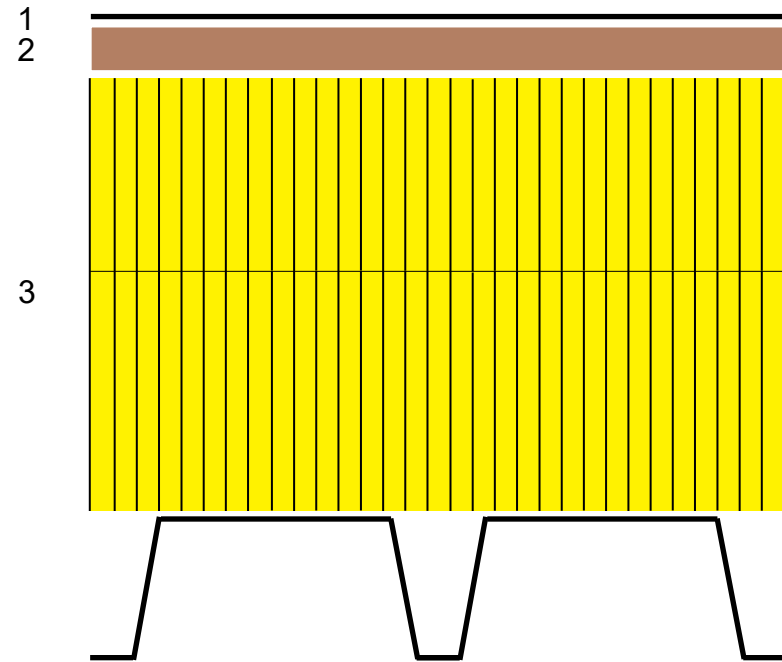
Roof: N.I.C.

Roofing Materials:

1. Single-Ply
2. 1/2" Dens Deck
3. 4 1/2" (2" + 2 1/2") ISO

Deck: Metal Deck

Recommendations: N.I.C.



Roof Cut No.: 64

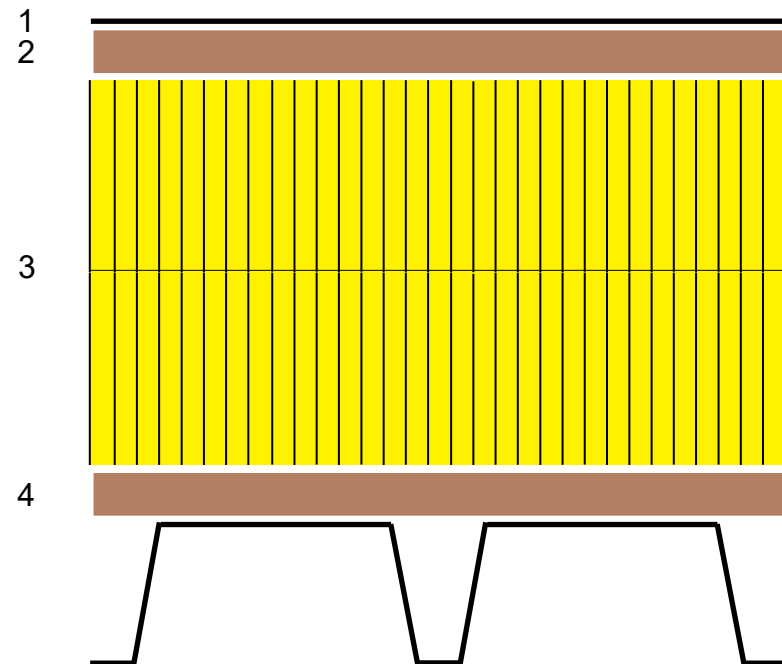
Roof: N.I.C.

Roofing Materials:

1. Single-Ply
2. 1/2" Dens Deck
3. 4" (2" & 2") ISO
4. 1/2" Dens Deck

Deck: Metal Deck

Recommendations: N.I.C.



Roof Cut No.: 65

Roof: N.I.C.

Roofing Materials: N.I.C.

Note:
No Cuts Taken, N.I.C.

Deck: N.I.C.

Recommendations: N.I.C.



Roof Cut No.: 66

Roof: N.I.C.

Roofing Materials: N.I.C.

Note:
No Cuts Taken, N.I.C.

Deck: N.I.C.

Recommendations: N.I.C.



Roof Cut No.: 67

Roof: 4-B

Roofing Materials:

1. 1 1/2" Granular Surface Foam
2. Mod. Bit. System
3. 2" LWIC [R-2.22]
4. 2 1/2" EPS [R-10.00]

Existing R-Value: R-12.22

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Mod. Bit. System (2)

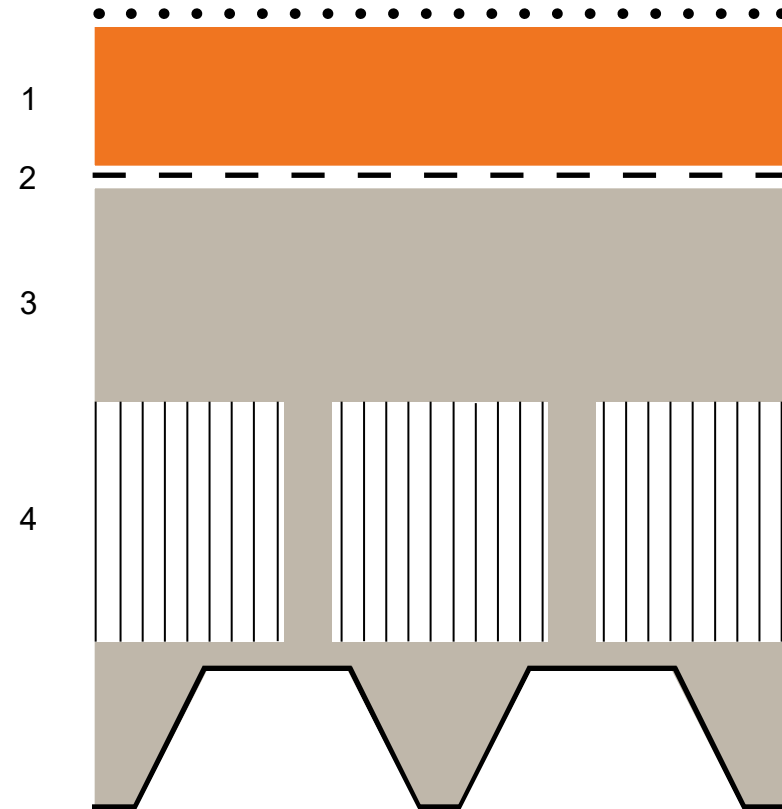
Existing to Remain:

- 2" LWIC (3) [R-2.22]
- 2 1/2" EPS (4) [R-10.00]

Add New:

- Separating Sheet
- 3" ISO [R-16.68]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-28.90



Roof Cut No.: 68

Roof: 4-B

Roofing Materials:

1. 2" Granular Surface Foam
2. Mod. Bit. System
3. 2" LWIC [R-2.22]
4. 2" EPS [R-8.00]

Existing R-Value: R-10.22

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Mod. Bit. System (2)

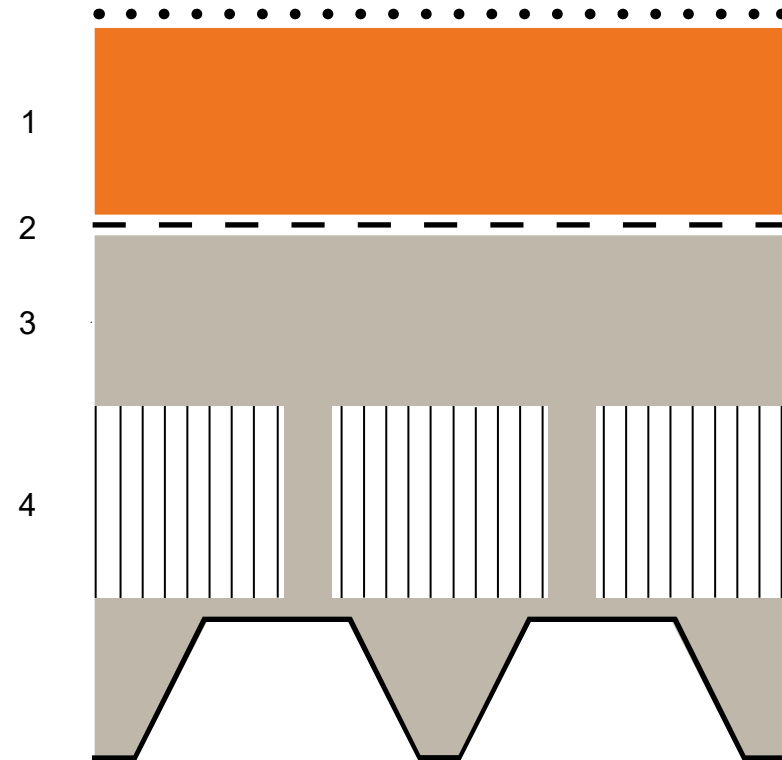
Existing to Remain:

- 2" LWIC (3) [R-2.22]
- 2 1/2" EPS (4) [R-8.00]

Add New:

- Separating Sheet
- 3" ISO [R-16.68]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-26.90



Roof Cut No.: 69

Roof: 4-C

Roofing Materials:

1. 1 1/2" Granular Surface Foam
2. Mod. Bit System
3. 2" LWIC [R-2.22]
4. 2" EPS [R-8.00]

Existing R-Value: R-10.22

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Mod. Bit. System (2)

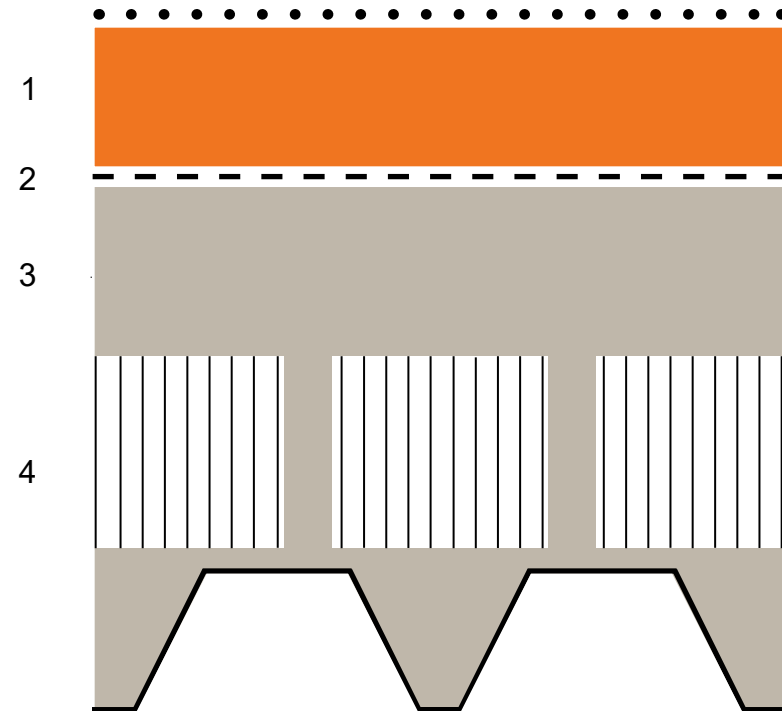
Existing to Remain:

- 2" LWIC (3) [R-2.22]
- 2 1/2" EPS (4) [R-8.00]

Add New:

- Separating Sheet
- 3" ISO [R-16.68]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-26.90



Roof Cut No.: 70

Roof: 4-C

Roofing Materials:

1. 1 1/2" Granular Surface Foam
2. Mod. Bit. System
3. 2" LWIC [R-2.22]
4. 4 1/2" EPS [R-18.00]

Existing R-Value: **R-20.22**

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Mod. Bit. System (2)

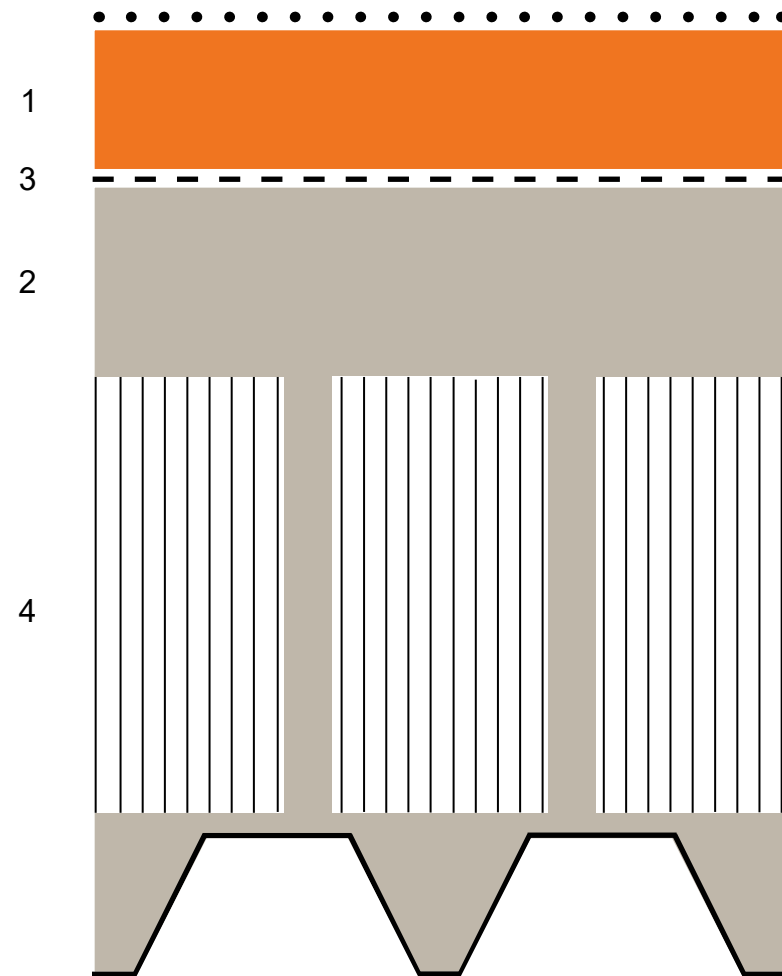
Existing to Remain:

- 2" LWIC (3) [R-2.22]
- 2 1/2" EPS (4) [R-18.00]

Add New:

- Separating Sheet
- 3" ISO [R-16.68]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: **R-36.90**



Roof Cut No.: 71

Roof: 4-C

Roofing Materials:

1. 1 1/2" Granular Surface Foam
2. Mod. Bit. System
3. 2" LWIC [R-2.22]

Existing R-Value: R-2.22

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Mod. Bit. System (2)

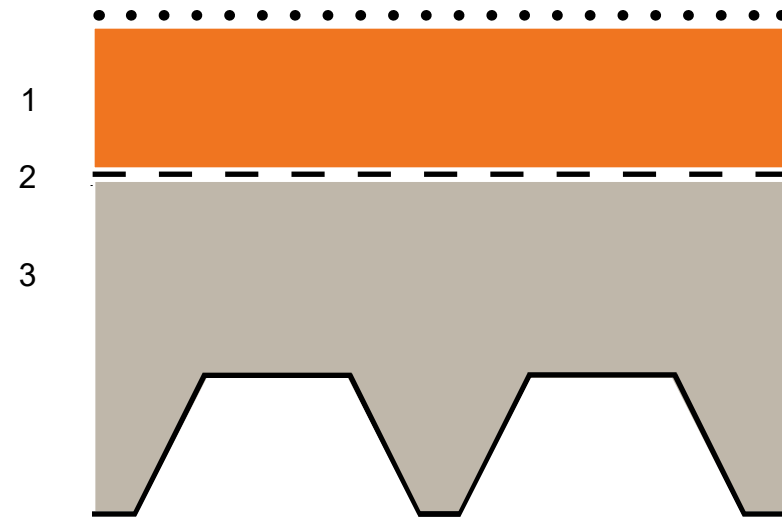
Existing to Remain:

- 2" LWIC (3) [R-2.22]

Add New:

- Separating Sheet
- 3" ISO [R-16.68]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-18.90



Roof Cut No.: 72

Roof: 4-C

Roofing Materials:

1. 1 1/2" Granular Surface Foam
2. Mod. Bit. System
3. 2" LWIC [R-2.22]
4. 3" EPS [R-12.00]

Existing R-Value: R-14.22

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Mod. Bit. System (2)

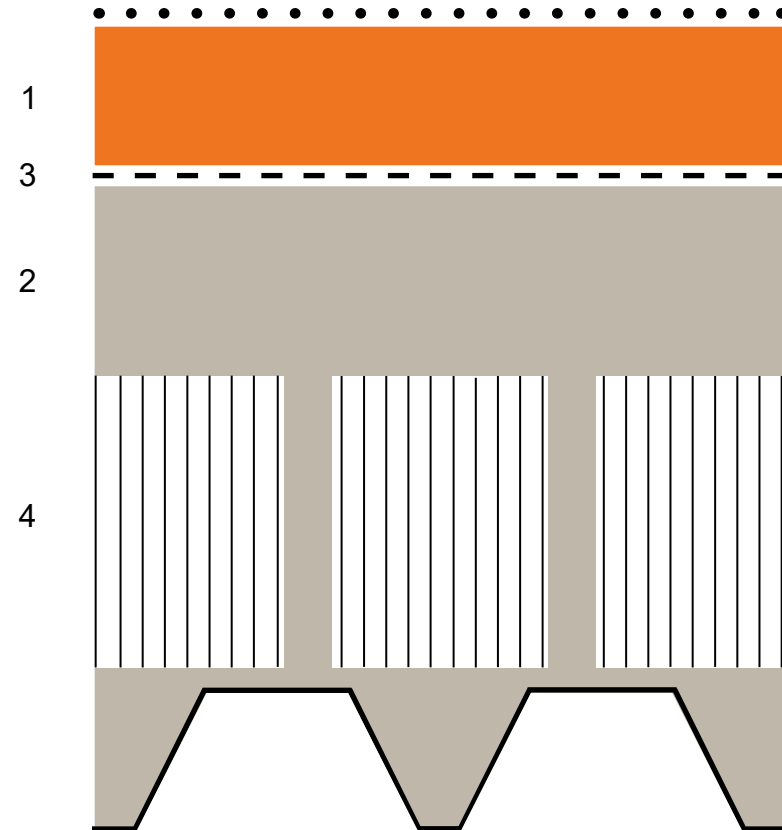
Existing to Remain:

- 2" LWIC (3) [R-2.22]
- 3" EPS (4) [R-12.00]

Add New:

- Separating Sheet
- 3" ISO [R-16.68]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-30.90

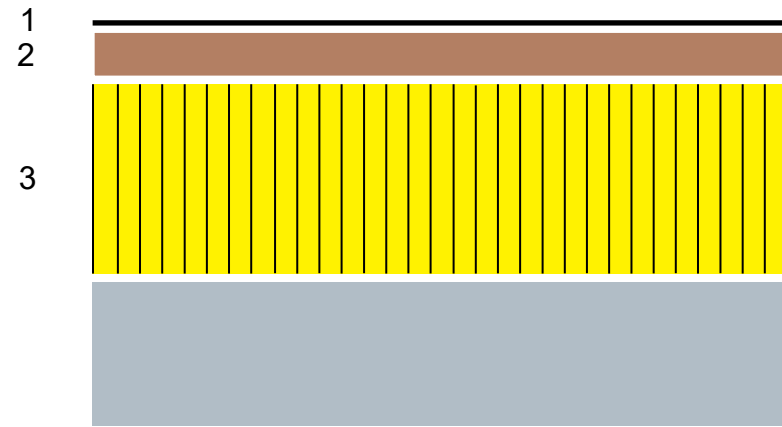


Roof Cut No.: 73

Roof: 3-E

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. 2" ISO [R-11.12]



Existing R-Value: R-11.12

Deck: Concrete Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)

Existing to Remain:

- 2" ISO (3) [R-11.12]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 74

Roof: 3-E

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. 2" ISO [R-11.12]

Existing R-Value: R-11.12

Deck: Concrete Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)

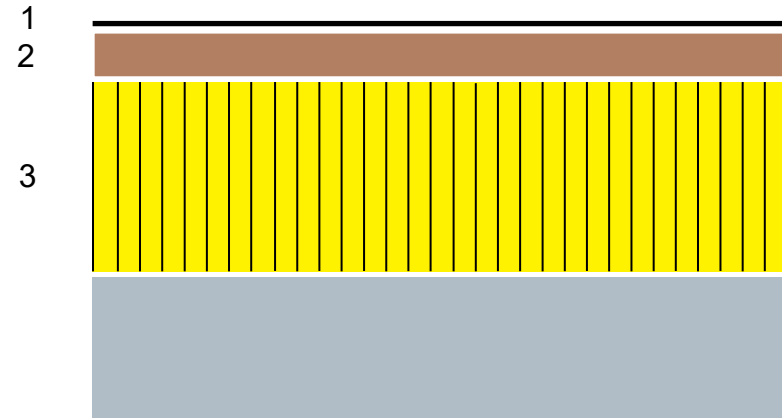
Existing to Remain:

- 2" ISO (3) [R-11.12]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 75

Roof: 3-D

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 4 1/2" (1/2" + 2" + 2") ISO
[R-25.02]

Existing R-Value: R-25.02

Deck: Concrete Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

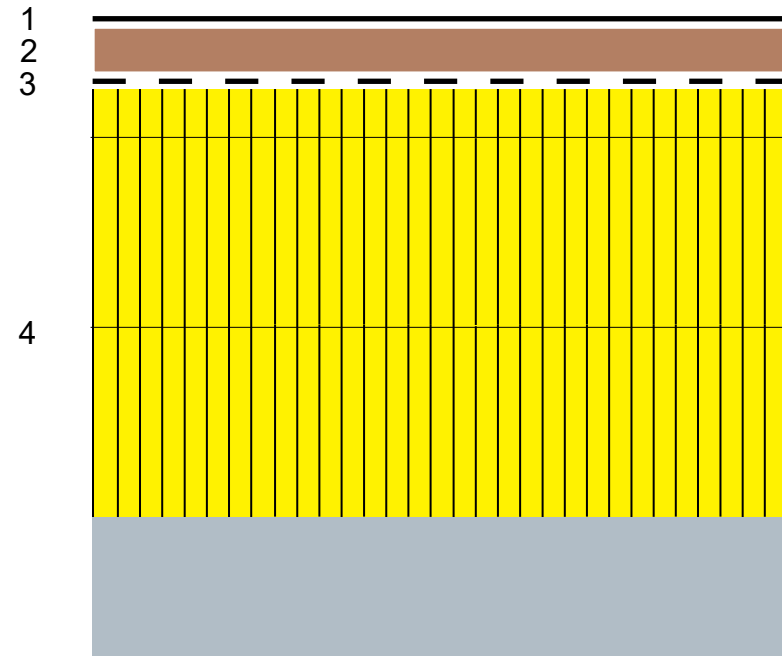
Existing to Remain:

- 4 1/2" ISO (4) [R-25.02]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-36.14



Roof Cut No.: 76

Roof: 3-D

Roofing Materials:

1. Mod. Bit. System
2. 1/2" Dens Deck
3. Single-Ply
4. 2" ISO [R-11.12]

Existing R-Value: R-11.12

Deck: Concrete Deck

Recommendations:

Remove:

- Mod. Bit. System (1)
- 1/2" Dens Deck (2)
- Single-Ply (3)

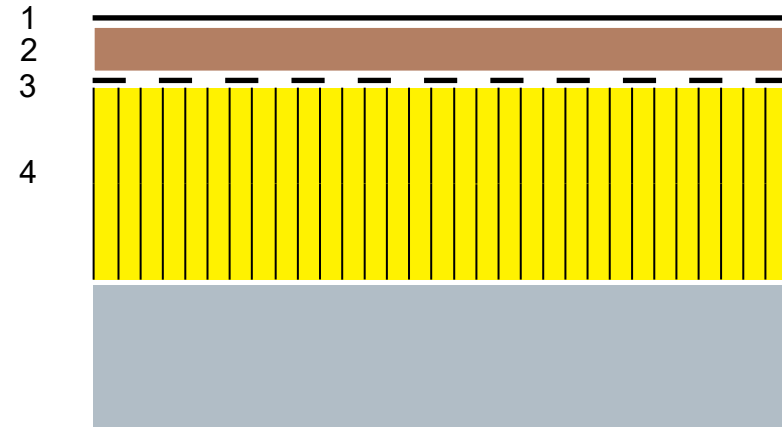
Existing to Remain:

- 2" ISO (4) [R-11.12]

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.24



Roof Cut No.: 77

Roof: 6-A

Roofing Materials:

1. 1 1/4" Granular Surface Foam
2. Single-Ply
3. 1 1/2" ISO [R-8.34]
4. 1/2" Dens Deck

Existing R-Value: R-8.34

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Single-Ply (2)
- 1 1/2" ISO (3) [R-8.34]
- 1/2" Dens Deck (4)

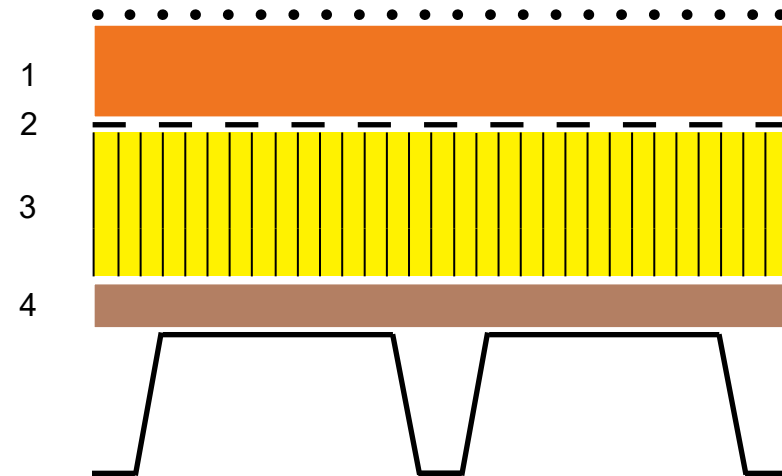
Existing to Remain:

- Nothing

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-11.12



Roof Cut No.: 78

Roof: 6-A

Roofing Materials:

1. 1 3/4" Granular Surface Foam
2. Single-Ply
3. 7" ISO [R-38.92]
4. 1/2" Dens Deck

Existing R-Value: R-38.92

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Single-Ply (2)
- 7" ISO (3) [R-38.92]
- 1/2" Dens Deck (4)

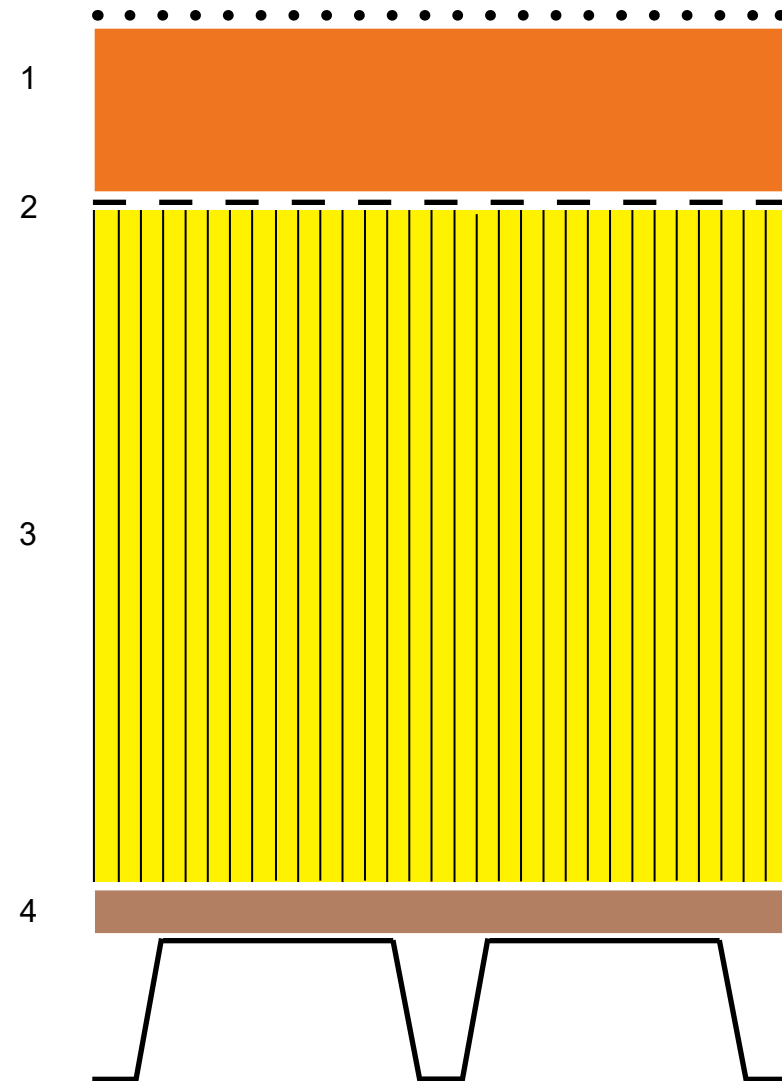
Existing to Remain:

- Nothing

Add New:

- 7 3/4" ISO [R-43.09]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-43.09



Roof Cut No.: 79

Roof: 4-G

Roofing Materials:

1. 1 1/2" Granular Surface Foam
2. Mod. Bit. System
3. 2" LWIC [R-2.22]

Existing R-Value: **R-2.22**

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Mod. Bit. System (2)

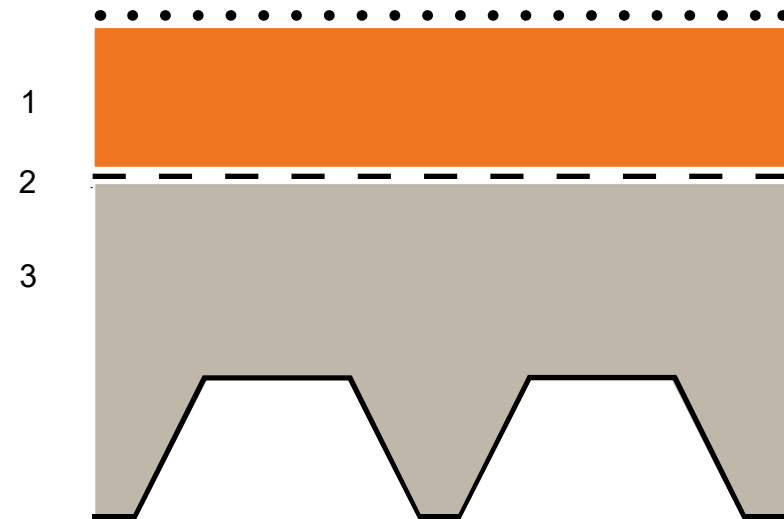
Existing to Remain:

- 2" LWIC (3) [R-2.22]

Add New:

- Separating Sheet
- 3" ISO [R-16.68]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: **R-18.90**



Roof Cut No.: 80

Roof: 4-G

Roofing Materials:

1. 1 1/2" Granular Surface Foam
2. Mod. Bit. System
3. 2" LWIC [R-2.22]

Existing R-Value: R-2.22

Deck: Metal Deck

Recommendations:

Remove:

- Granular Surface Foam (1)
- Mod. Bit. System (2)

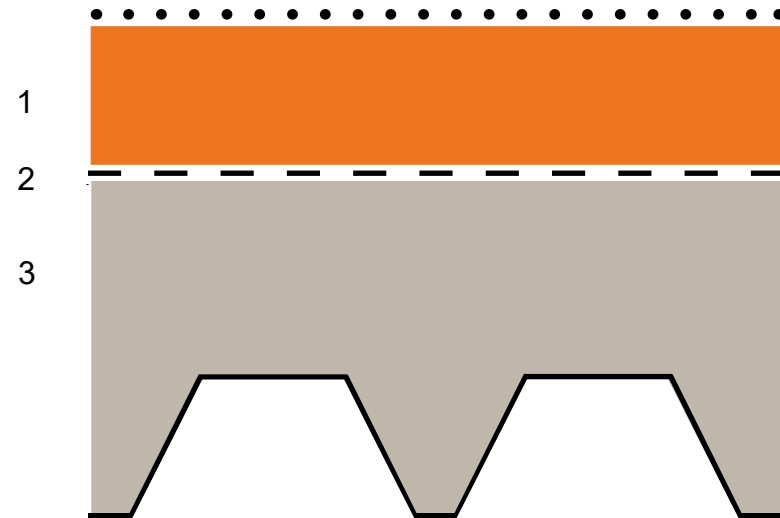
Existing to Remain:

- 2" LWIC (3) [R-2.22]

Add New:

- Separating Sheet
- 3" ISO [R-16.68]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-18.90



Roof Cut No.: 81

Roof: 4-K

Roofing Materials:

1. Single-Ply
2. 3" (1" + 2") ISO [R-16.68]
3. 1/2" Dens Deck

Existing R-Value: R-16.68

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

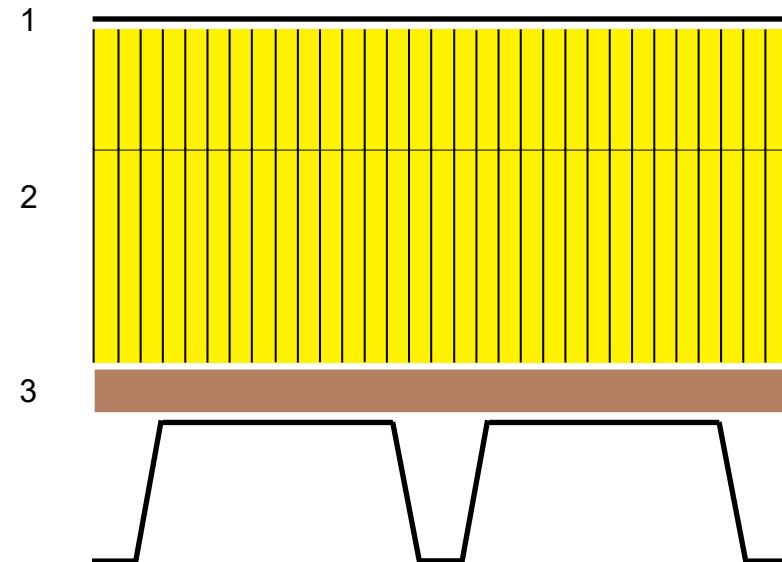
Existing to Remain:

- 3" ISO (2) [R-16.68]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-27.80



Roof Cut No.: 82

Roof: 4-K

Roofing Materials:

1. Single-Ply
2. 2" ISO [R-11.12]
3. 1/2" Dens Deck

Existing R-Value: R-11.12

Deck: Metal Deck

Recommendations:

Remove:

- Single-Ply (1)

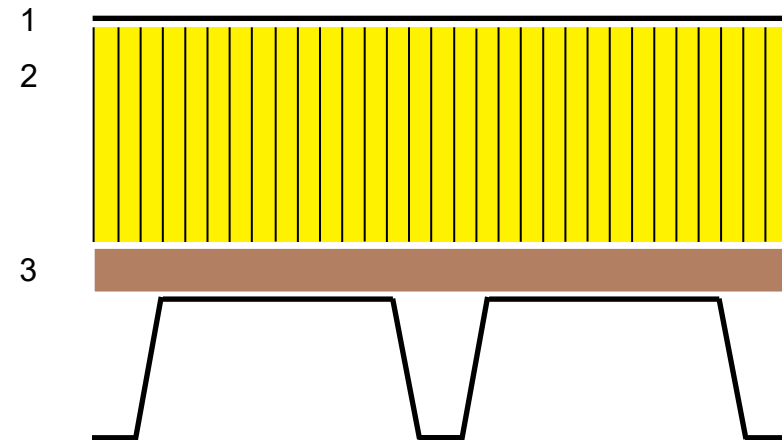
Existing to Remain:

- 2" ISO (2) [R-11.12]
- 1/2" Dens Deck (3)

Add New:

- 2" ISO [R-11.12]
- 1/2" Cover Board
- 60 Mil. Single-Ply [SRI-80+]

New R-Value: R-22.14



Infrared Inspection Report

A/R/C Associates, Incorporated

Orange County Convention Center-Orlando, FL



**Qualitative Infrared Walk-on Roof Verification Scan
October 13 & 17, 2016**



Brady Infrared Inspections, Inc.

www.bradyinfrared.com

(772) 288-9884



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A/R/C Associates, Incorporated- Orange County Convention Center

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INFRARED INSPECTION REPORT ROOF MOISTURE SURVEY A/R/C Associates, Incorporated

End User: Mr. Tyler Hall
Date Inspected: October 13 & 17, 2016
Purpose of Inspection: Condition Assessment

Forward

This Qualitative Report of Infrared Inspection documents the results of a walk-on roof survey that is in follow up to an infrared aerial roof moisture survey that was flown on September 8th, 2016 on Phase-I Thru Phase-IV roof areas at the Orange County Convention Center in Orlando, FL. The purpose of this inspection was to verify and quantify the aerial infrared thermal anomalies indicative of trapped moisture in the roof insulation material as part of a large scale roof replacement program.

This Qualitative Report of Infrared Inspection meets the documentation requirements of the Infraspection Institute Standard for Infrared Inspection of Insulated Roofs, 2011 Edition.

How Infrared Thermography Works To Detect Moisture

Infrared imagers “see” the heat radiated from your equipment in real time, just like a video camera sees visible light. Colors in the scene of a thermogram (pictures of heat), are matched to a reference bar. Colors appearing closer to the top or right of the reference bar indicate higher temperatures.

Trapped moisture in roof systems adds mass to the insulation layer. During the day, the sun heats the surface. Dry areas due to less mass warm at a quicker rate than wet areas, but also store less thermal energy than wet areas. At night, the energy stored in the roof systems is lost through radiant, convective and conductive effects. Since the wet insulation has more solar energy stored than dry area, these areas take longer to cool. When viewed with an infrared camera under cooling conditions, wet insulation appears as hot/warm areas.

Inspection Methods

Equipment Used

A long-wave focal plane array FLIR FLIR B660 with a 32-degree lens was used to conduct this scan with an emissivity setting on the camera set at 1.00.

Also used was a Tramex RWS moisture meter designed for detecting elevated moisture levels in flat roof systems.

Climatic / Scanning Conditions

A delta temperature of approximately 10-degrees F, from the daytime high temperature (mid 80 degree F) to the temperature at the time of the scan (mid 70 degree F), was present during scanning.

The roof surface was scanned on the evenings of October 13 & 18, 2016 under cooling conditions. The roof surface was dry in 99.9% of the roof areas during the inspection. The small amount of standing water that was observed was small puddles concentrated around crickets; places where the roof surface was heavily stained with mud / residue.

Daytime highs reached mid-80 degree F, and dropped to mid-70s degree F during the evening hours. Skies were partly cloudy and winds less than 10 mph.

Infrared Scanning

The roof was scanned by a walk-on survey. The boundary of thermal anomalies determined to represent moisture were outlined with high-visibility paint, measured for size, and labeled for reference in this report. A Tramex RWS moisture meter was used to non-destructively confirm the presences of moisture for all thermal anomalies reported. A selected amount of thermal anomalies were cored using standard roofing practices to verify the presences of moisture.

Construction Information

Roof construction varied from roof to roof with some roofs having a lower (older) roof system below. However, there were three general roof systems inspected that represent the highest roof system in the total assemblies:

1. Single-ply membrane with iso-board insulation
2. Modified bitumen with dens-board insulation
3. Sprayed polyurethane foam

Please note that construction details are simplified and generalized for thermal assessment and should not be used for detailed planning – contractors / engineers should conduct independent evaluation of construction as they deem necessary for repair / construction work. Detailed roof construction assessments were NOT performed by Thermographer.

Inspection Findings

Thermograms showing the thermal pattern of trapped moisture for the various roof sections for Phase-I thru Phase-VI are presented in Appendices I thru VI in the rear of the report.

A summary of the various roof areas and total number and amount of roof area affected by water intrusion is presented below.

Roof Designation	Number of Anomalies	Total Area of Anomalies
Phase-I	26	2022 sq ft.
Phase-II	10	779 sq ft.
Phase-III	14	2682 sq ft.
Phase-IV	2	220 sq ft.
Phase-V	13	966 sq ft.
Phase-VI	5	76 sq ft.

There was a very high correlation rate between thermal anomalies observed on the aerial infrared imaging and what was observed during the walk-on roof infrared inspection. A few of the roof areas presented challenges

The foam roofs on Phase-VI showed a few anomalies that tested positive for elevated moisture, but there were a few places that showed thermal signatures that did not test positive with our moisture meter. It is possible that the anomalies represent deep seated moisture in a lower roof system or has something to do with the foam application. We also feel that anomalies that were documented in this report represent moisture that is fairly shallow in the foam roof assembly. There are numerous blisters and de-bonded areas of foam that may be allowing varying amounts of water inside and along the margins of the blisters that is not being picked up by the camera;

because this water cools and warms very quickly with the surrounding foam (it does not add mass to the foam, rather it pools on top of it).

Phase-V roof in the area of the long round-nosed higher roof section also presented some challenges to accurately identify a couple of anomalies along the wall to roof interface. During the inspection, the roof overhang was trapping radiant IR energy and keeping the roof warm directly under the roof while the roof area outside of the overhand was cooling at a rapid rate. This created a sharp thermal gradient along the wall and overhang (see Thermograms 5-10 and 5-11 in Appendix-V). We did verify these areas for elevated moisture, but feel that there may be more moisture present that wraps around and in front of the roof section of roof (maybe another 100 to 200 sq. ft.)

Complete documentation about this infrared inspection and report is presented on Page-4.

I hope you find the enclosed information responsive to your needs. If you have any questions or need additional information regarding the contents of this report or about the methods and procedures of the inspection please feel free to contact me at (772) 288-9884. It was a pleasure working with you of this project.

Sincerely,



James Brady,
Level III Certified Infrared Thermographer

**REPORT SUMMARY FOR
A/R/C Associates, Incorporated
Orange County Convention Center**

Client / Facility Location

Report Date: October 21, 2016
Type of Inspection: Roof Moisture Survey
Purpose of Inspection: Condition Assessment
Date of Inspection: October 13 & 17, 2016
End User: Mr. Tyler Hall
Project Location: Orlando, FL

Thermographer / Qualified Assistant

Thermographer: James Brady
Certification Level/Number: Level III #6099– Infrasppection Institute

Equipment Used

Thermal Imager: FLIR B660 S/N: 404002655
Detector: Focal plane array (FPA) uncooled microbolometer; 640 x 480 pixels
Spectral Range: 7.5 to 13 μ m
Thermal Resolution: <45mK at 30° C (86° F)
Field of view / min focus distance: 24° x 18° / 0.3 m
Image Frequency: 30 Hz (non-interlaced)
Spatial Resolution (IFOV): 0.65 mrad
Temperature Range: -40° C to +120° C (-40° F to +248° F)
Accuracy: \pm 2° C (\pm 3.6°F) or 2% of reading
IR Lens: 32-degree

Weather / Comments

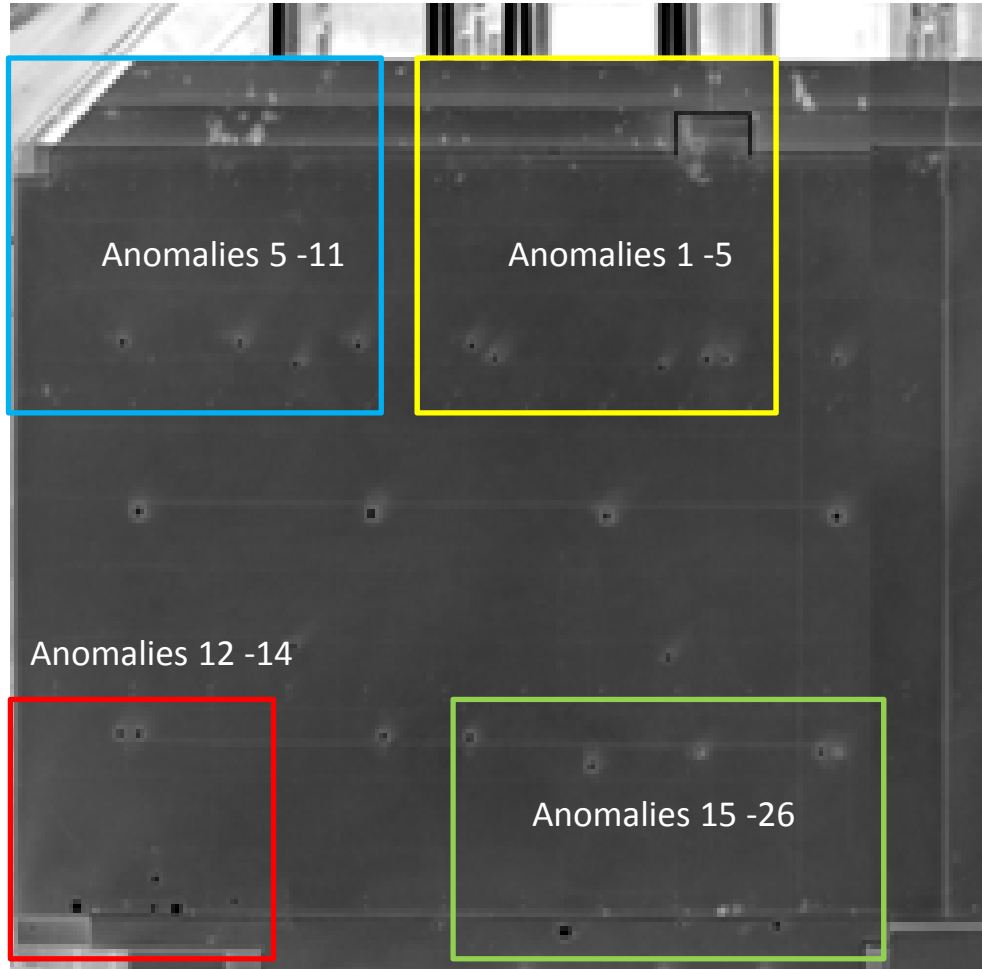
Weather Data Day of Inspection: Daytime Temps: mid 80's Evening: mid 70's
Partly Cloudy Sky, Winds , <10 mph

Appendix I

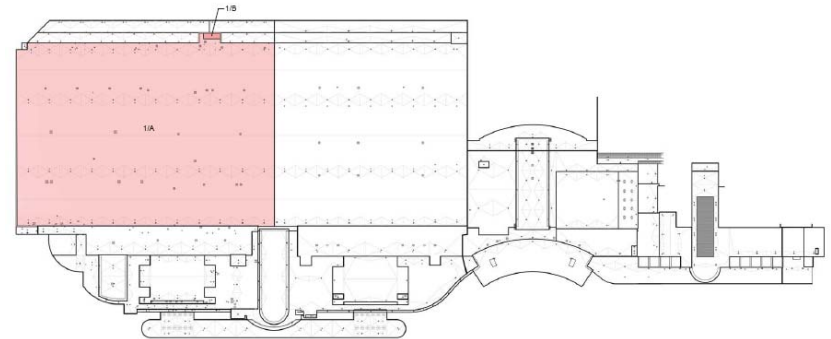
Phase I Roof Thermograms

Brady Infrared Inspections, Inc.

Phase-I Roof Anomaly Map



OCCC West Building Roof Repairs
Phase Identification Plan



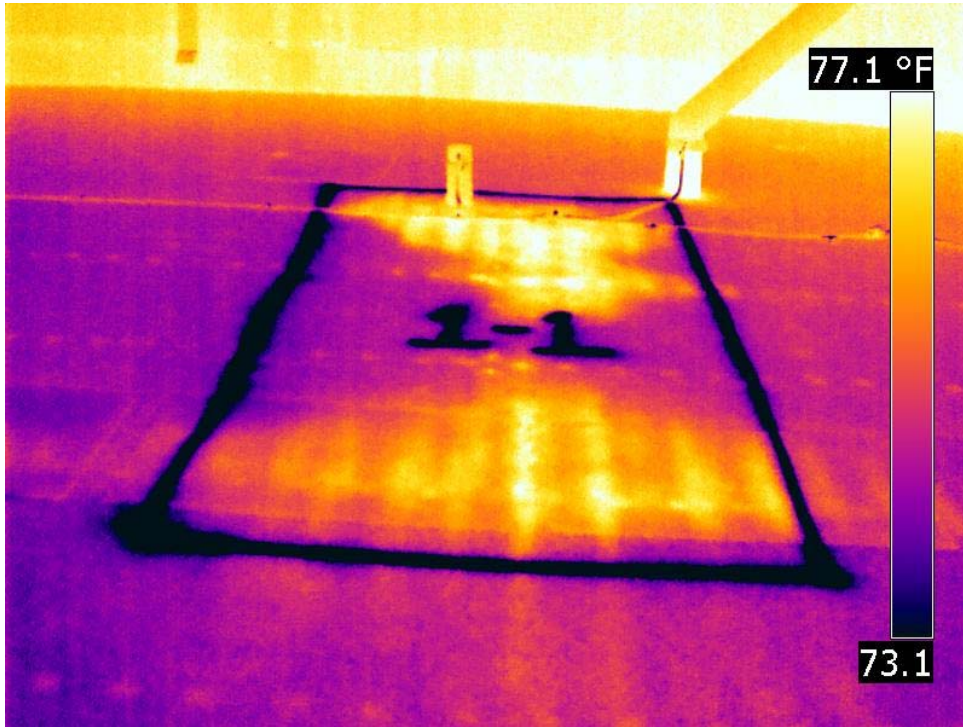


THERMOGRAM IMAGE – 1-1

Orange County Convention Center – Phase 1

Area 1 = 55 sq. ft.

Date: 10/13/2016
Time: 7:56:37 PM
IR Image: IR_0335.jpg

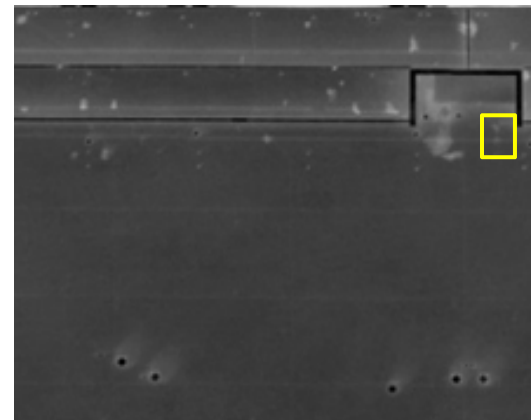


Visual Image

Infrared Image – light area shows location of trapped moisture



Visual image of wet core cut



Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 1-2

Orange County Convention Center – Phase 1

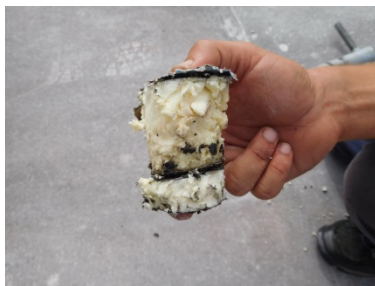
Area 2 = 610 sq. ft.

Date: 10/13/2016
Time: 8:00:44 PM
IR Image: IR_0336.jpg

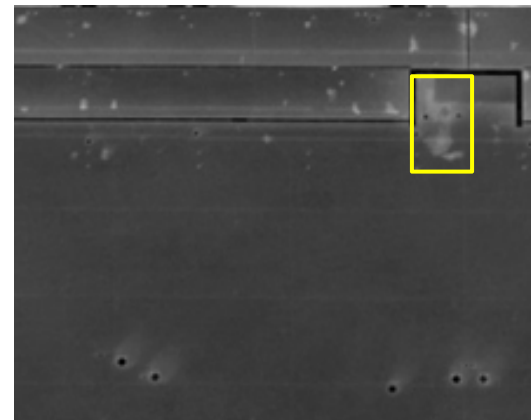


Visual Image

Infrared Image – light area shows location of trapped moisture



Visual image of wet core cut



Yellow Box =
Location of Thermal
Anomaly

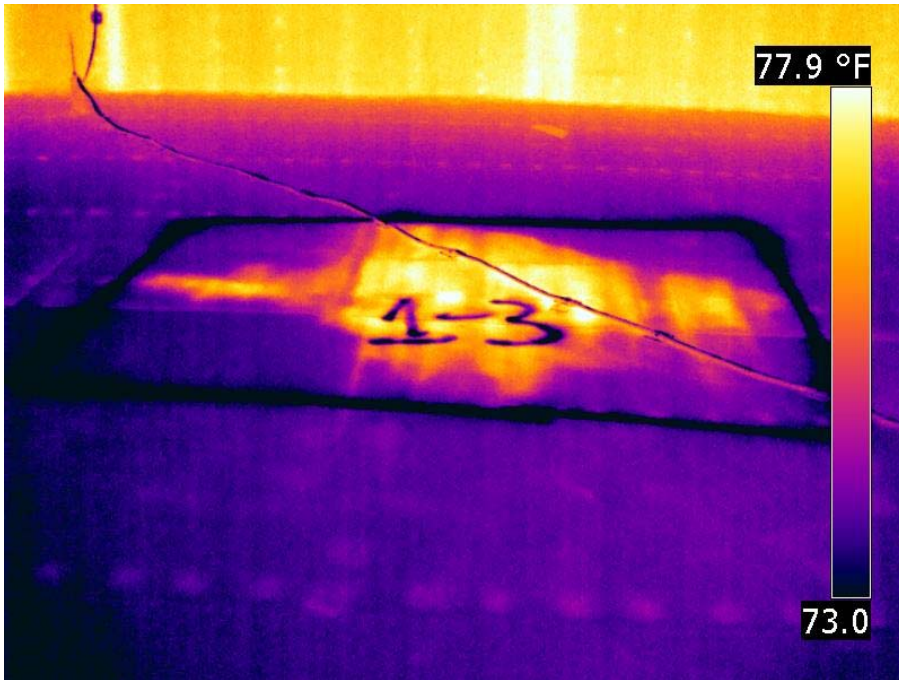


THERMOGRAM IMAGE – 1-3

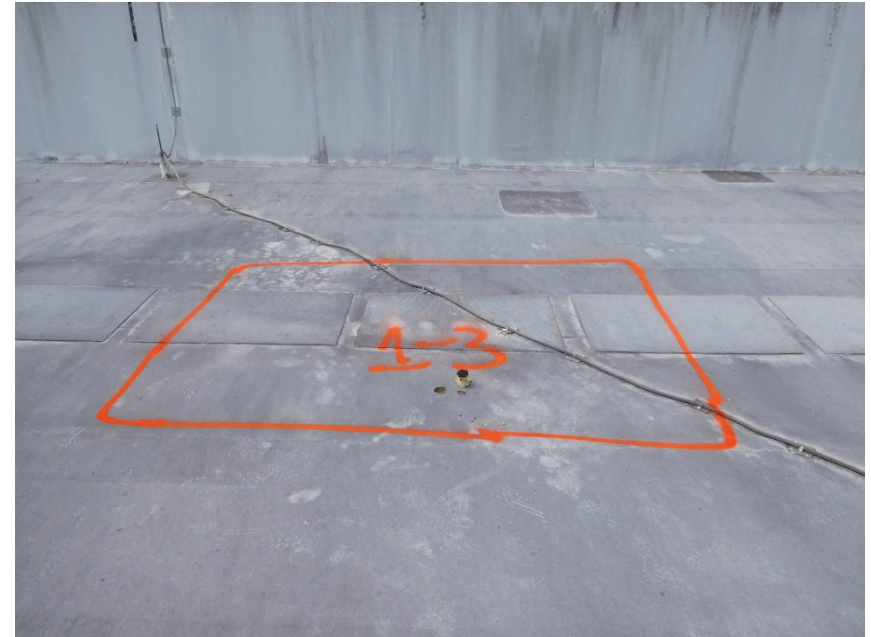
Orange County Convention Center – Phase 1

Area 3 = 30 sq. ft.

Date: 10/13/2016
Time: 8:02:50 PM
IR Image: IR_0337.jpg



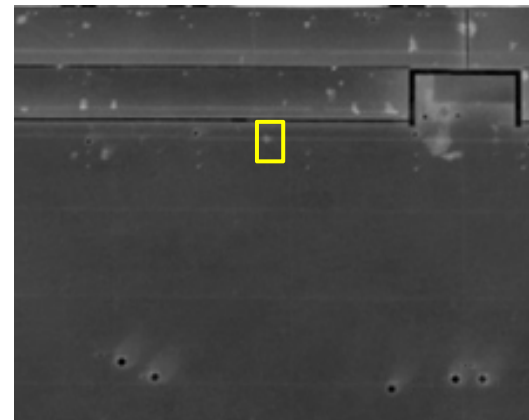
Infrared Image – light area shows location of trapped moisture



Visual Image



Visual image of wet core cut

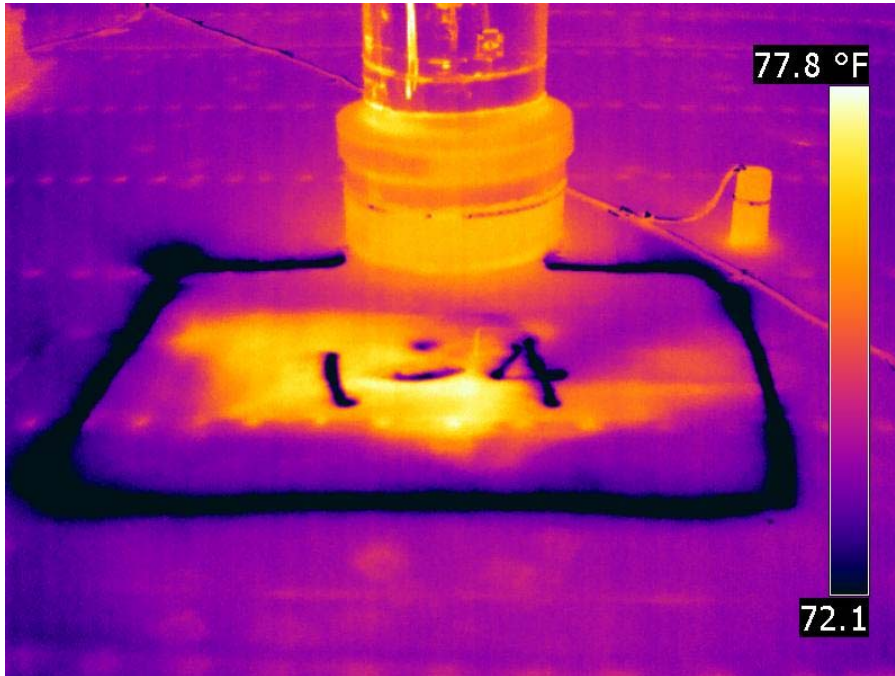


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 1-4
Orange County Convention Center – Phase 1
Area 4 = 24 sq. ft.

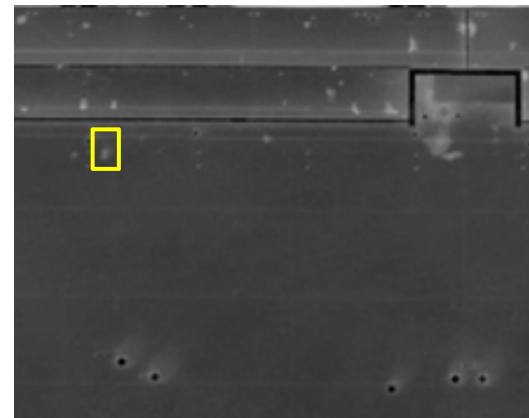
Date: 10/13/2016
Time: 8:04:21 PM
IR Image: IR_0338.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

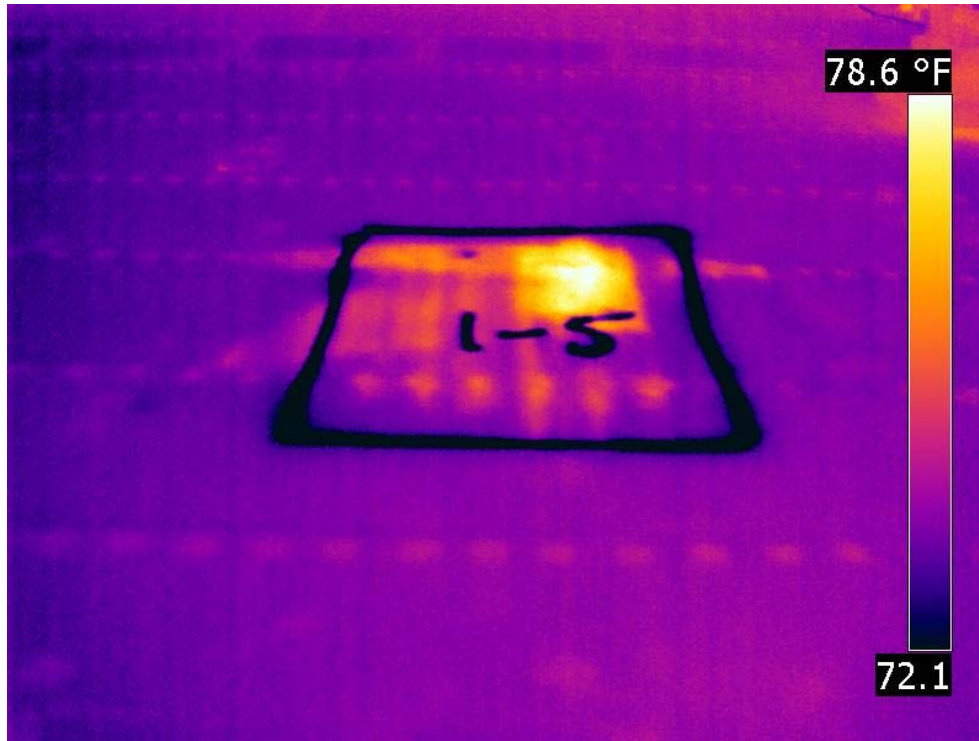


THERMOGRAM IMAGE – 1-5

Orange County Convention Center – Phase 1

Area 5 = 20 sq. ft.

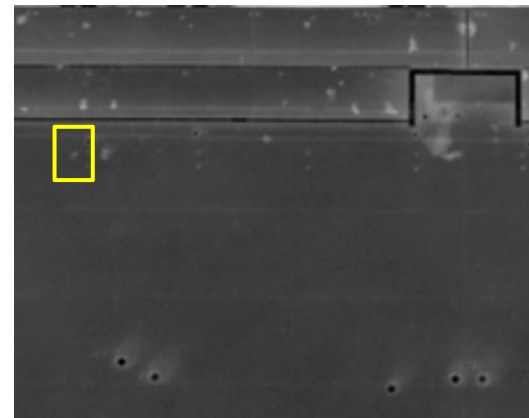
Date: 10/13/2016
Time: 8:05:46 PM
IR Image: IR_0339.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

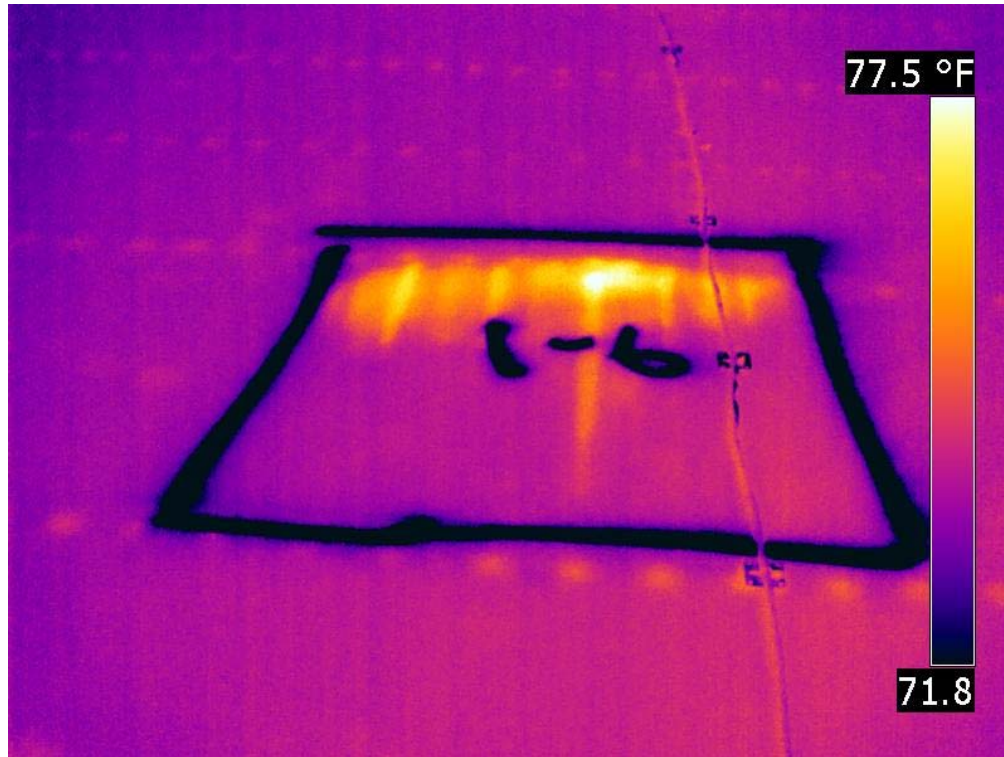


Yellow Box =
Location of Thermal
Anomaly

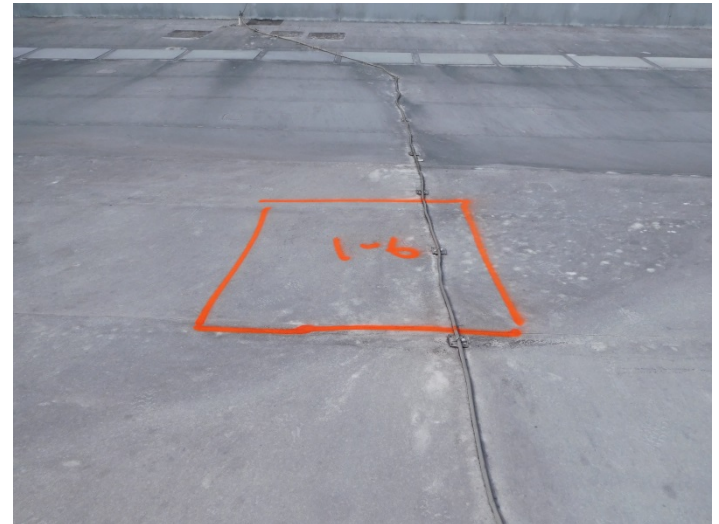


THERMOGRAM IMAGE – 1-6
Orange County Convention Center – Phase 1
Area 6 = 25 sq. ft.

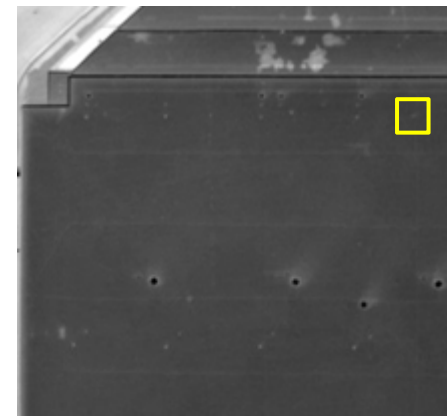
Date: 10/13/2016
Time: 8:06:54 PM
IR Image: IR_0340.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

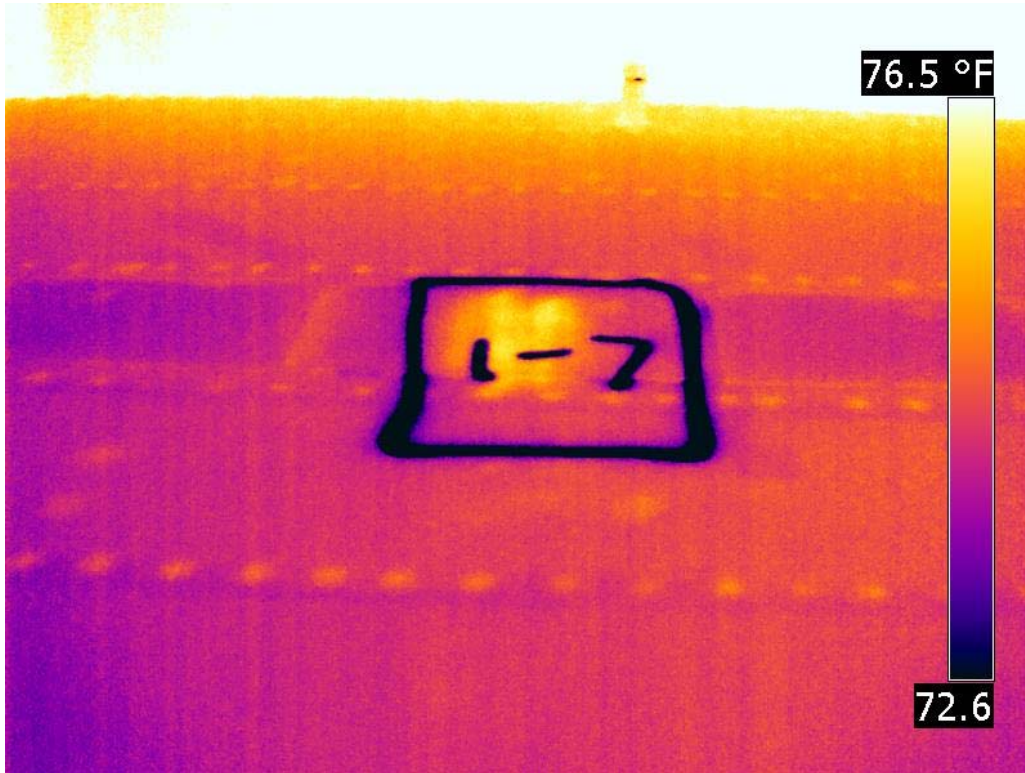


THERMOGRAM IMAGE – 1-7

Orange County Convention Center – Phase 1

Area 7 = 6 sq. ft.

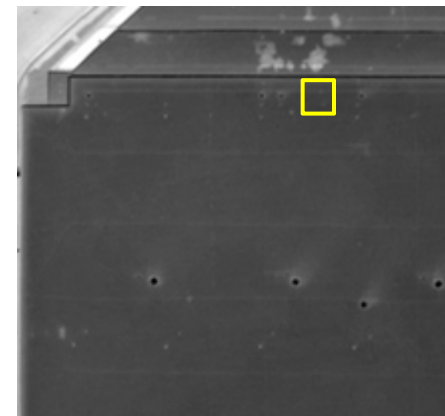
Date: 10/13/2016
Time: 8:09:46 PM
IR Image: IR_0341.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

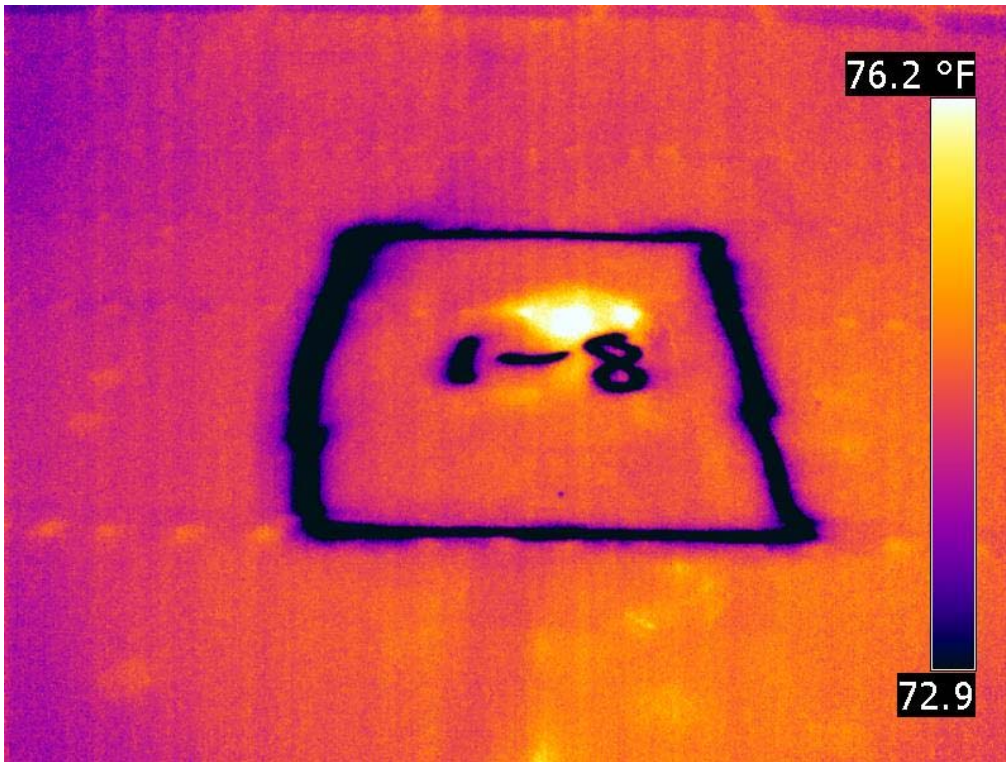


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 1-8
Orange County Convention Center – Phase 1
Area 8 = 28 sq. ft.

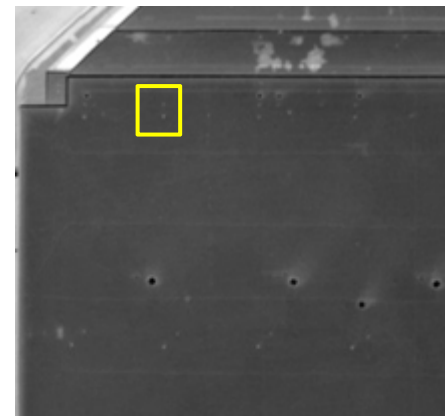
Date: 10/13/2016
Time: 8:11:21 PM
IR Image: IR_0342.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

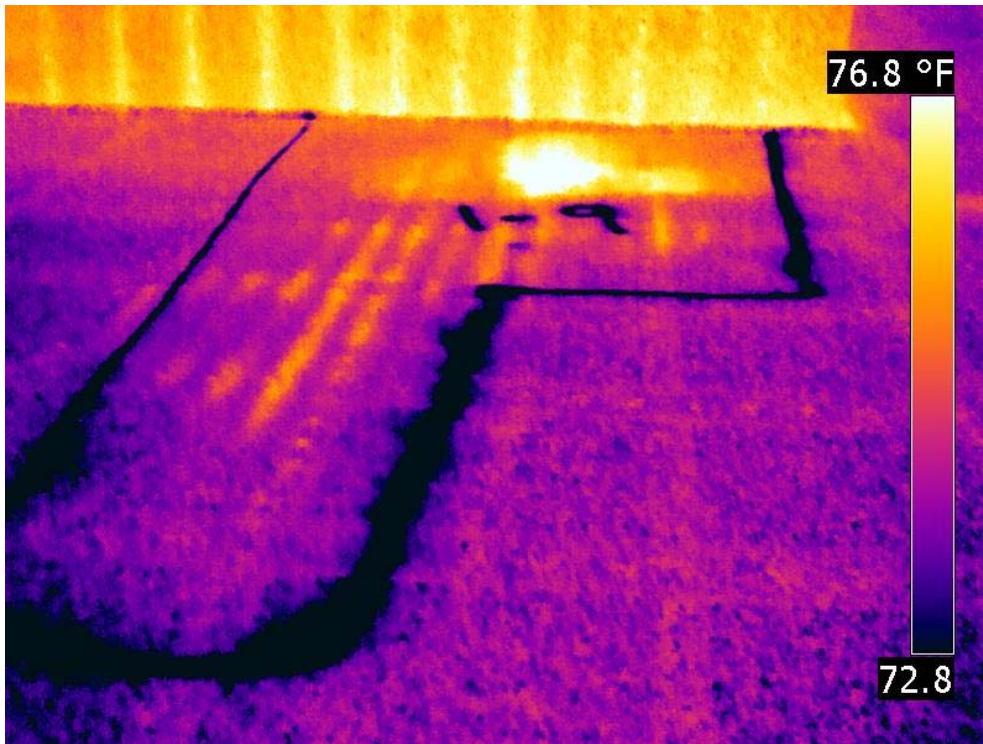


THERMOGRAM IMAGE – 1-9

Orange County Convention Center – Phase 1

Area 9 = 79 sq. ft.

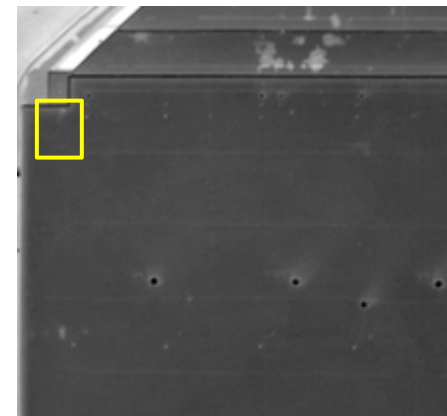
Date: 10/13/2016
Time: 8:16:17 PM
IR Image: IR_0343.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

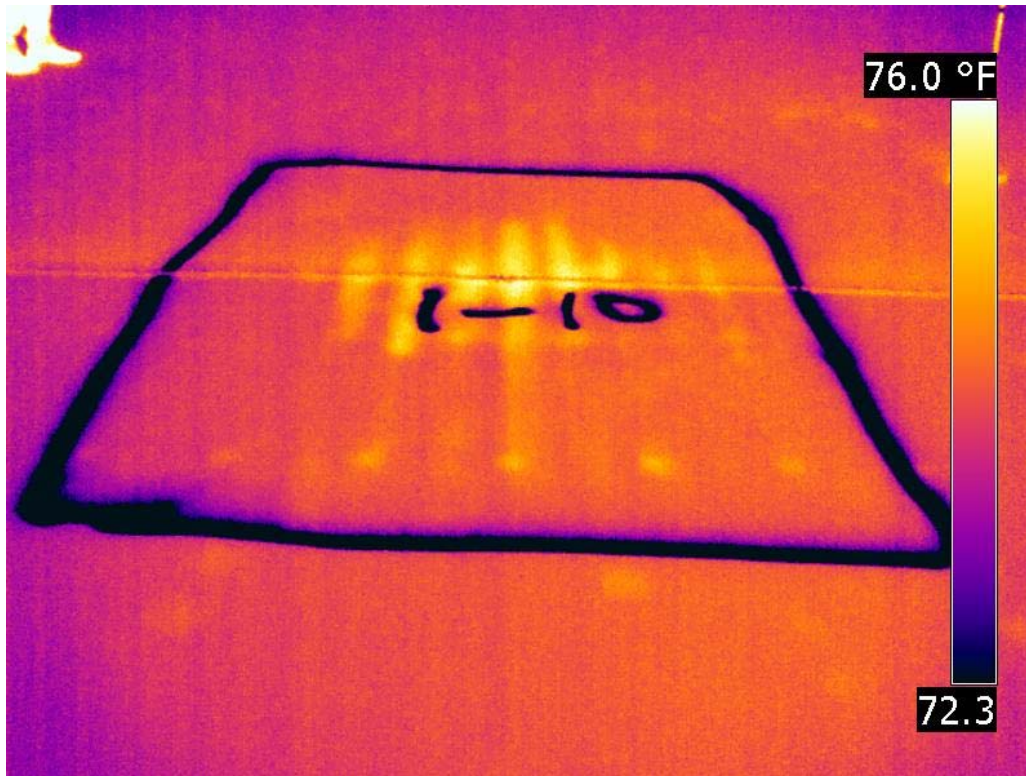


Yellow Box =
Location of Thermal
Anomaly

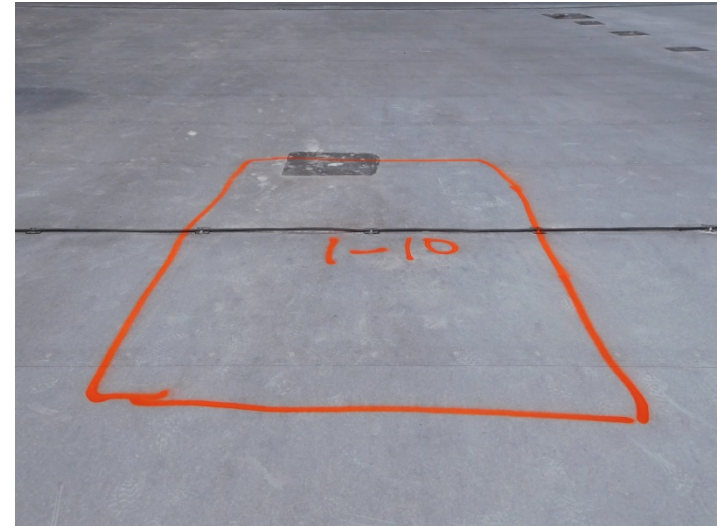


THERMOGRAM IMAGE – 1-10
Orange County Convention Center – Phase 1
Area 10 = 70 sq. ft.

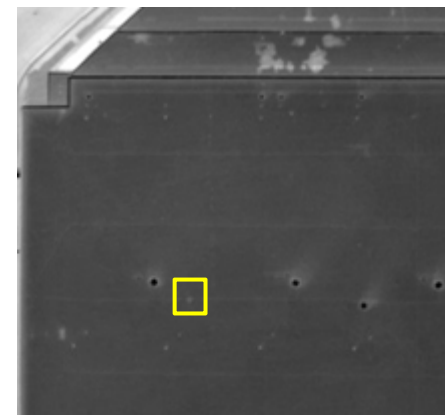
Date: 10/13/2016
Time: 8:22:50 PM
IR Image: IR_0344.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

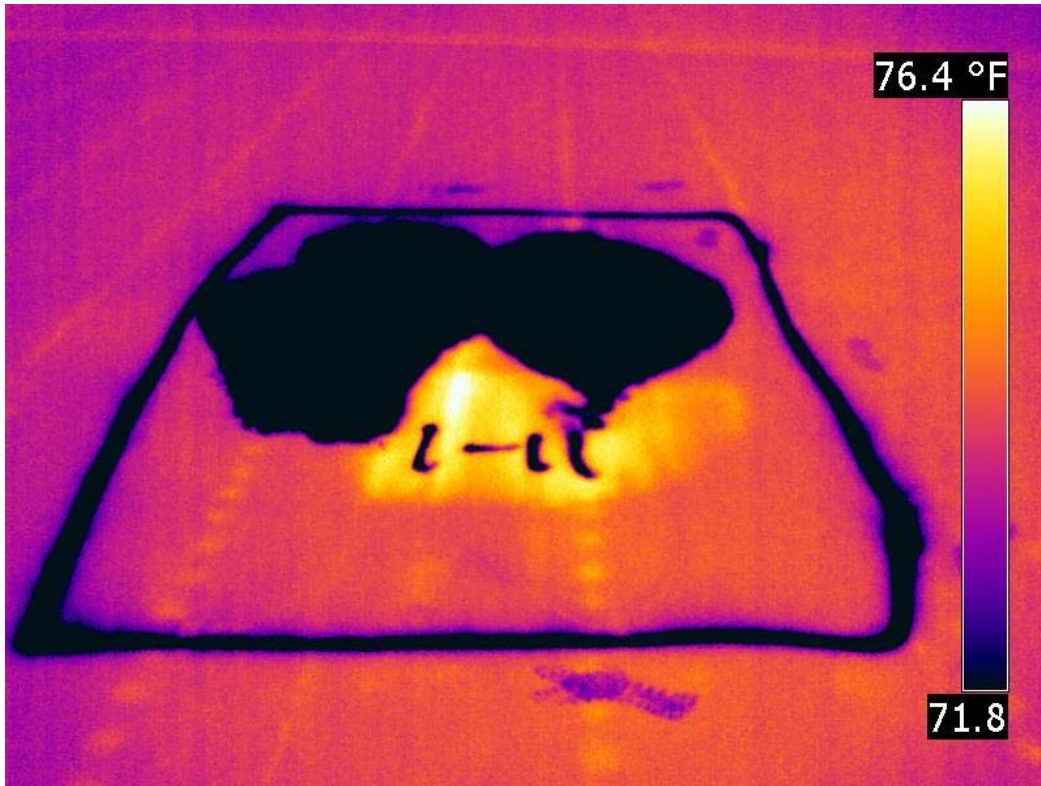


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 1-11
Orange County Convention Center – Phase 1
Area 11 = 84 sq. ft.

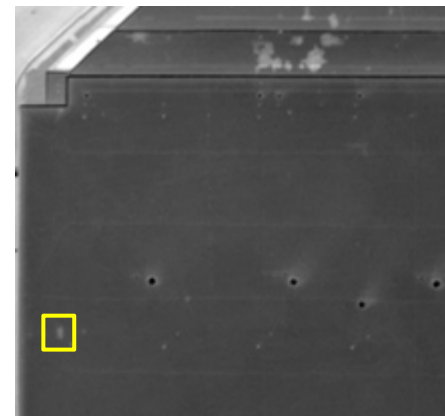
Date: 10/13/2016
Time: 8:24:08 PM
IR Image: IR_0345.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

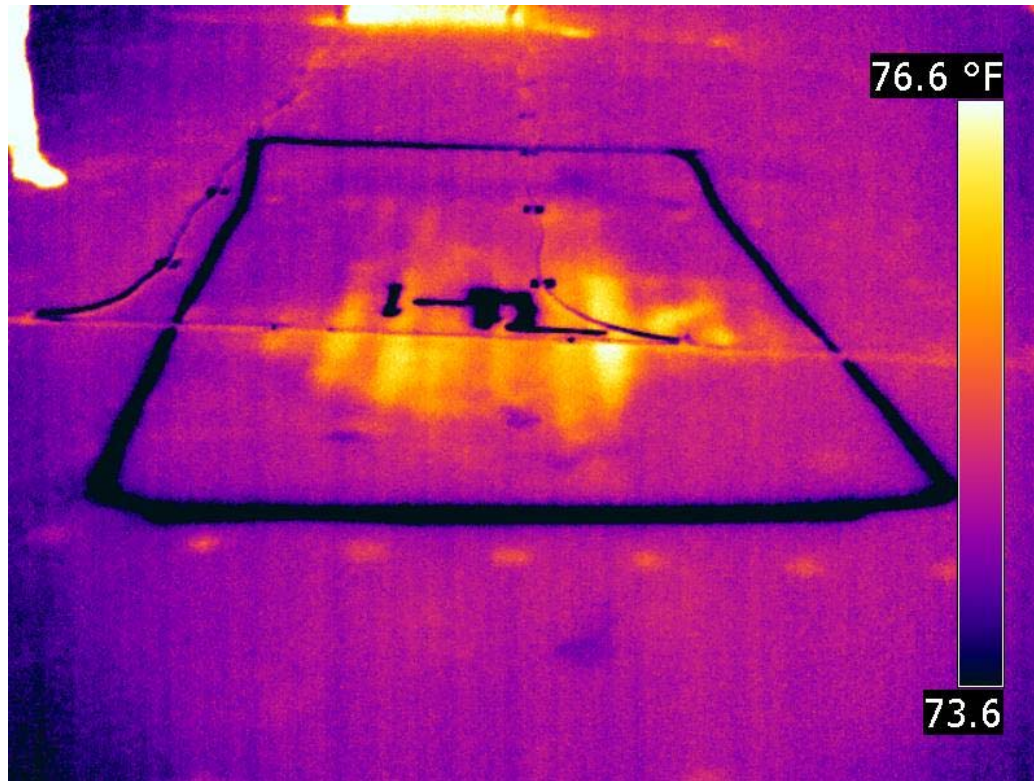


THERMOGRAM IMAGE – 1-12

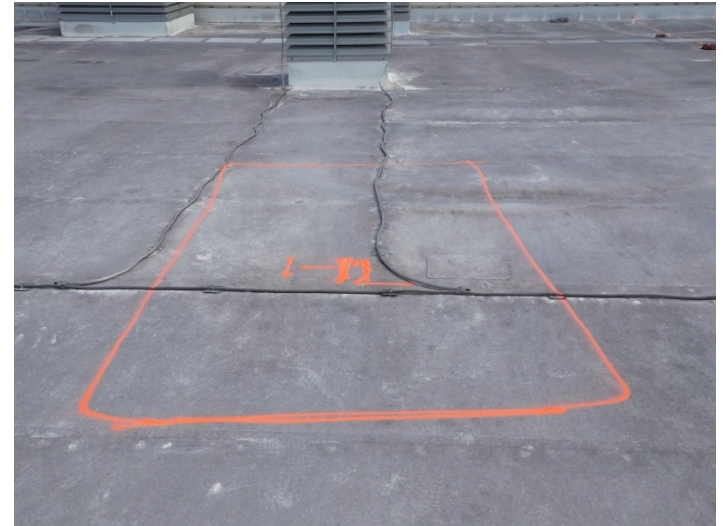
Orange County Convention Center – Phase 1

Area 12 = 28 sq. ft.

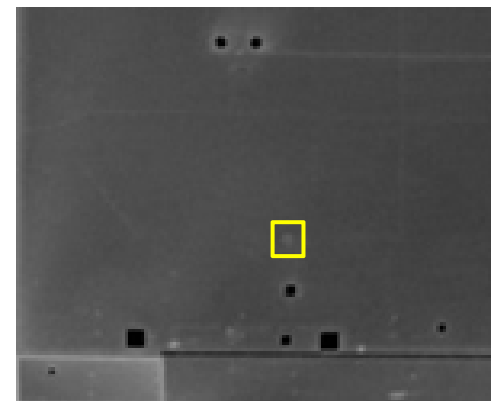
Date: 10/13/2016
Time: 8:30:46 PM
IR Image: IR_0346.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

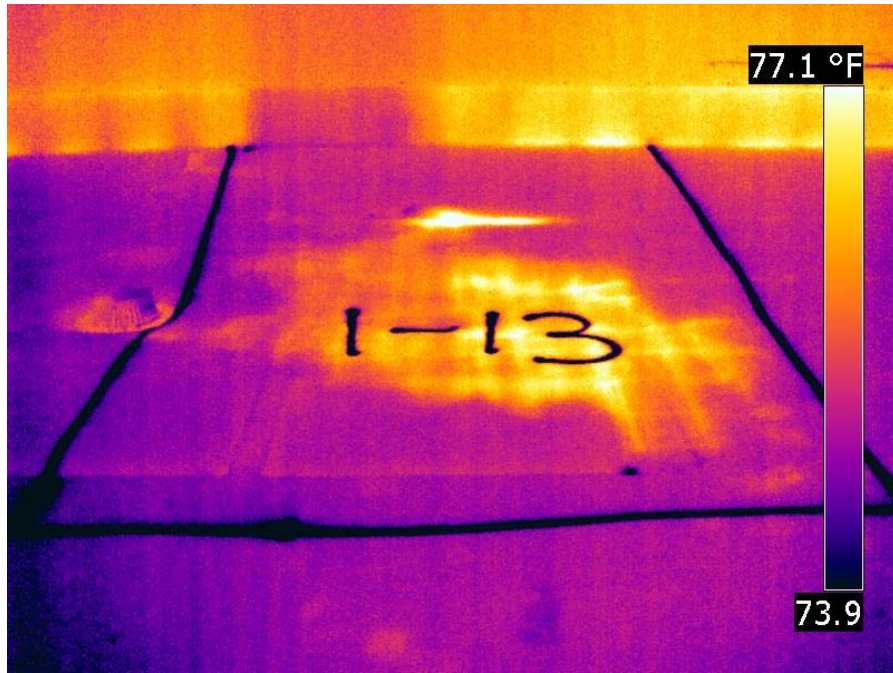


THERMOGRAM IMAGE – 1-13

Orange County Convention Center – Phase 1

Area 13 = 104 sq. ft.

Date: 10/13/2016
Time: 8:32:42 PM
IR Image: IR_0347.jpg

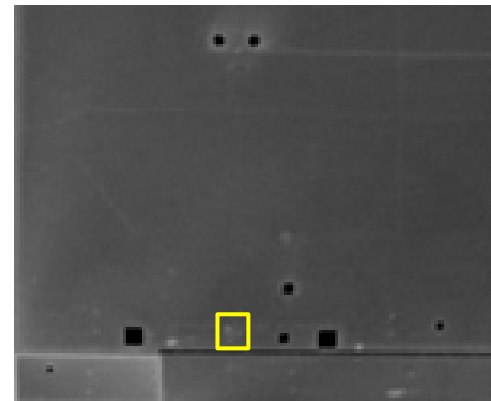


Visual Image

Infrared Image – light area shows location of trapped moisture



Visual image of wet core cut

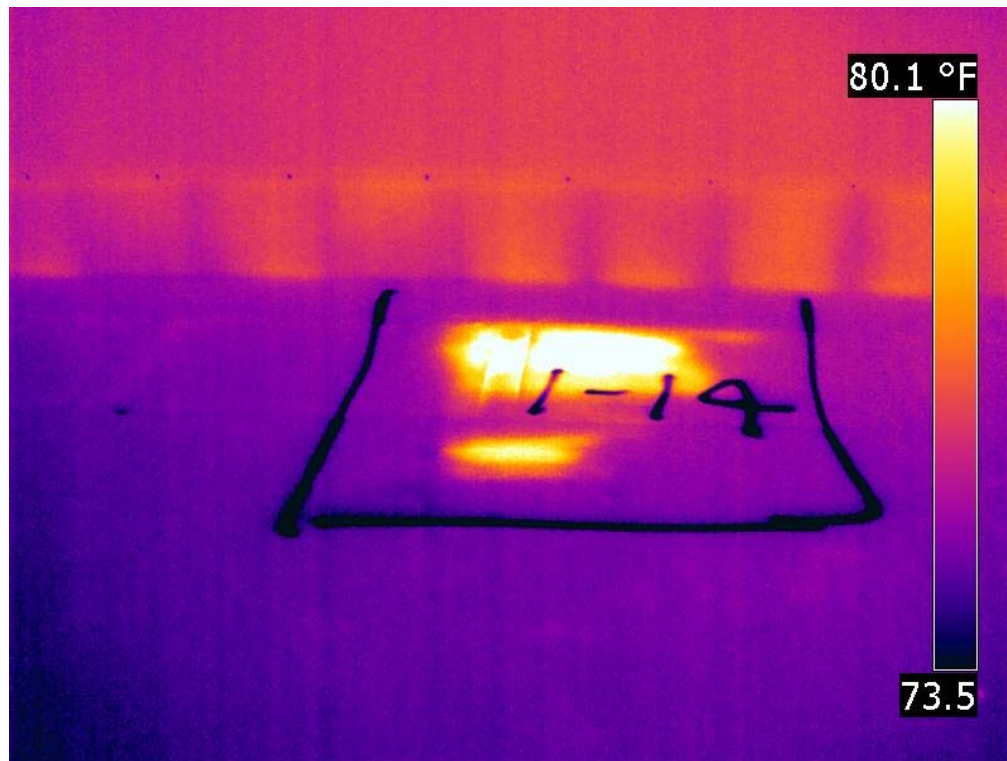


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 1-14
Orange County Convention Center – Phase 1
Area 14 = 16 sq. ft.

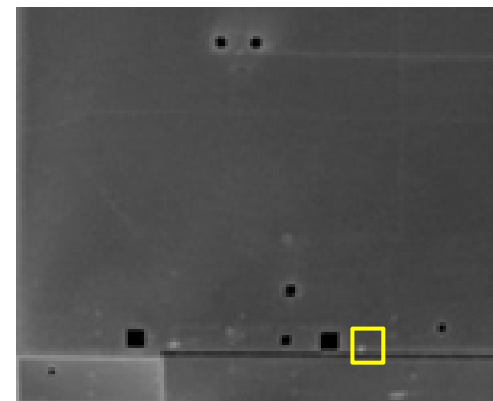
Date: 10/13/2016
Time: 8:33:45 PM
IR Image: IR_0348.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

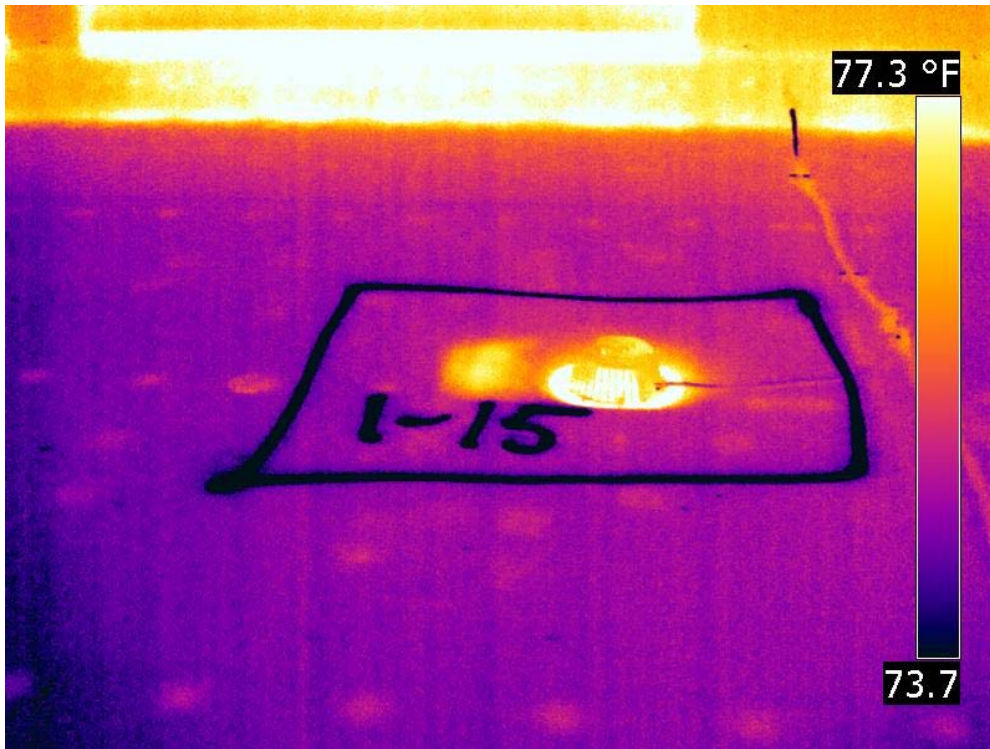


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 1-15
Orange County Convention Center – Phase 1
Area 15 = 20 sq. ft.

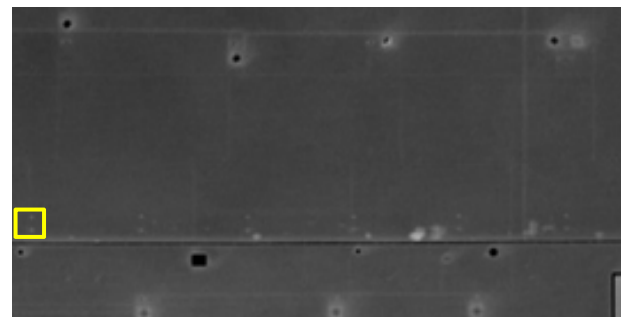
Date: 10/13/2016
Time: 8:36:40 PM
IR Image: IR_0349.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

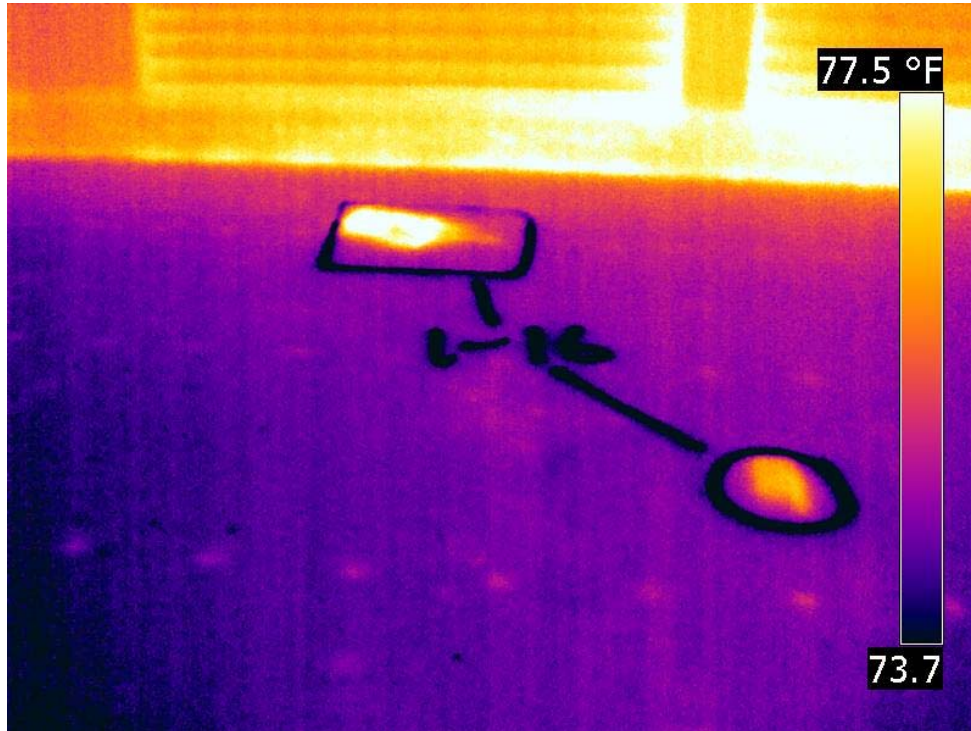


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 1-16
Orange County Convention Center – Phase 1
Area 16 = 6 sq. ft.

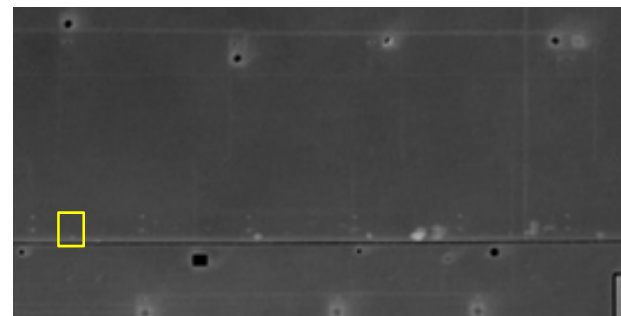
Date: 10/13/2016
Time: 8:37:50 PM
IR Image: IR_0350.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

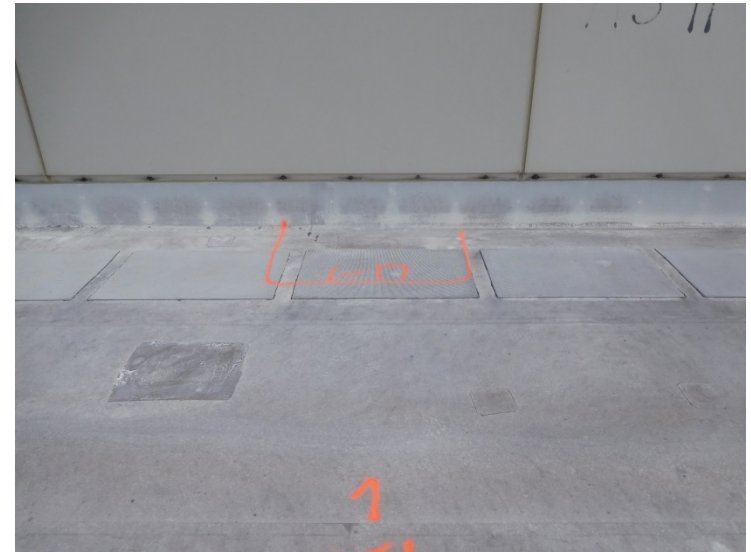
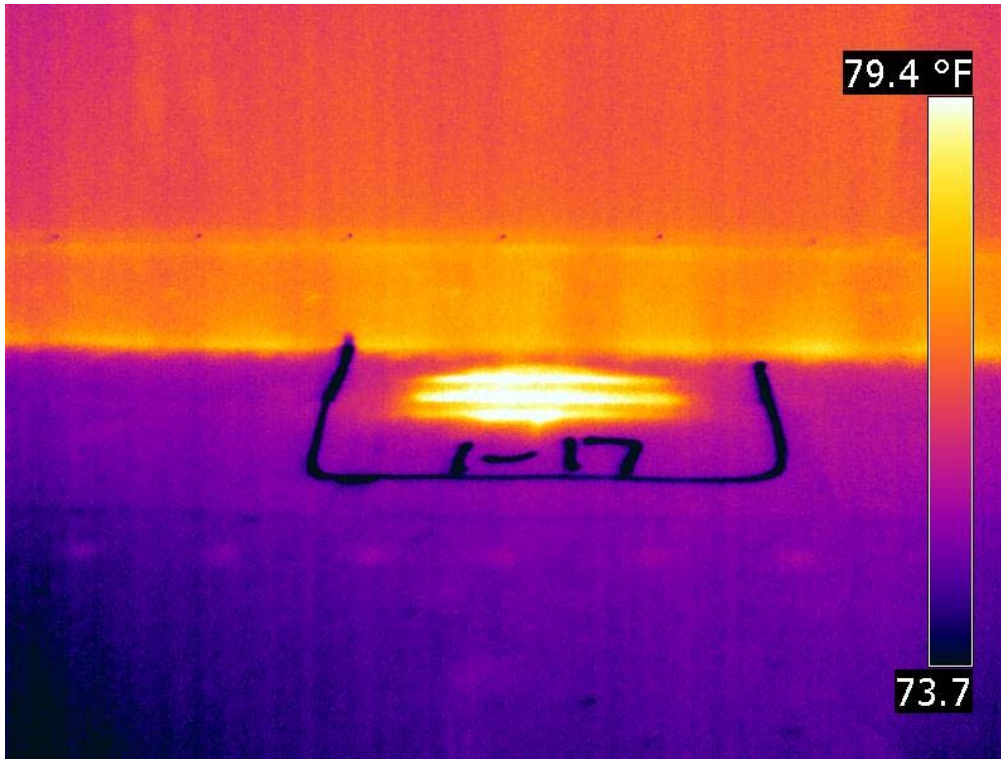


Yellow Box =
Location of Thermal
Anomaly



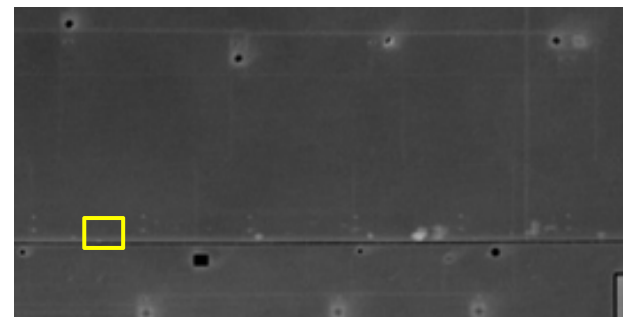
THERMOGRAM IMAGE – 1-17
Orange County Convention Center – Phase 1
Area 17 = 12 sq. ft.

Date: 10/13/2016
Time: 8:38:17 PM
IR Image: IR_0351.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture

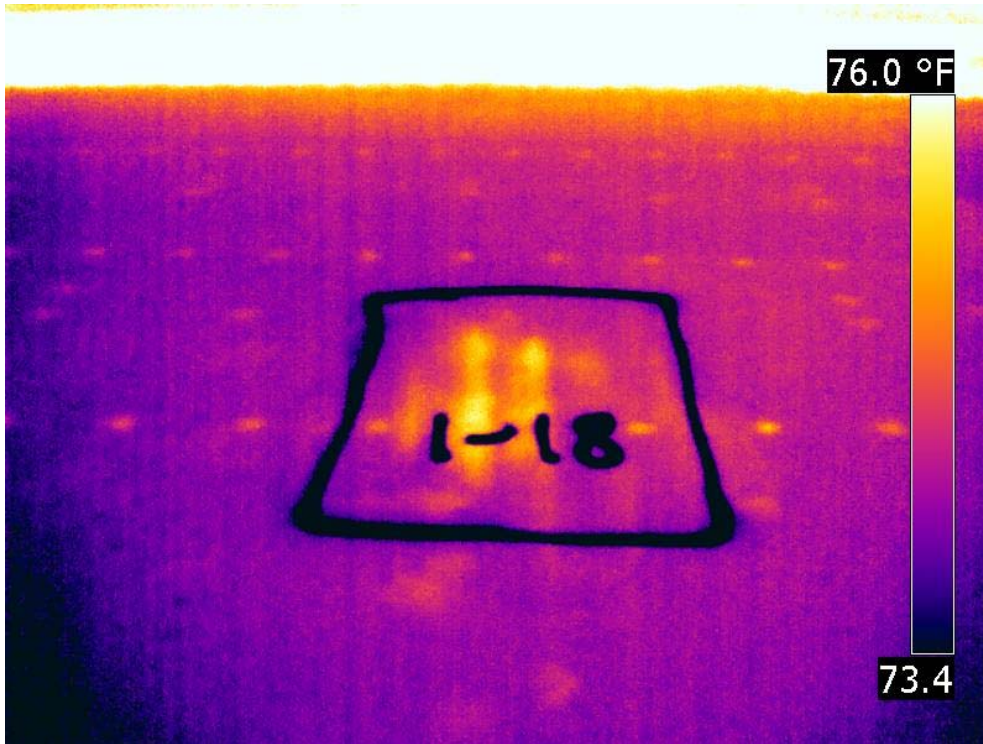


Yellow Box =
Location of Thermal
Anomaly



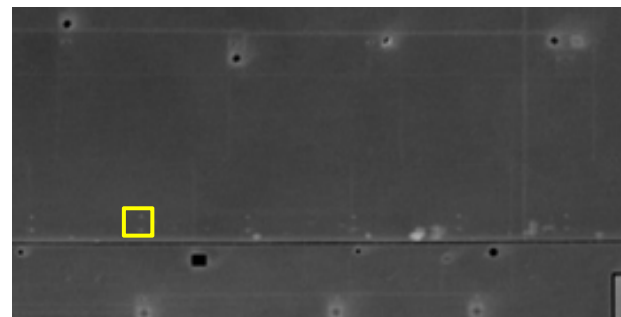
THERMOGRAM IMAGE – 1-18
Orange County Convention Center – Phase 1
Area 18 = 12 sq. ft.

Date: 10/13/2016
Time: 8:39:01 PM
IR Image: IR_0352.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture

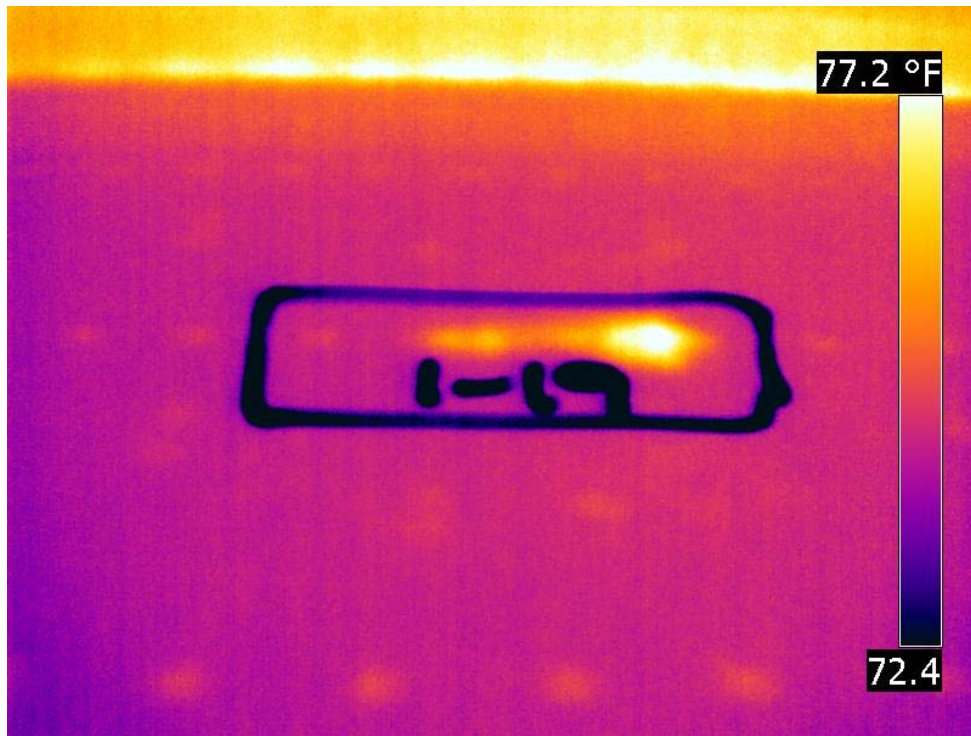


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 1-19
Orange County Convention Center – Phase 1
Area 19 = 8 sq. ft.

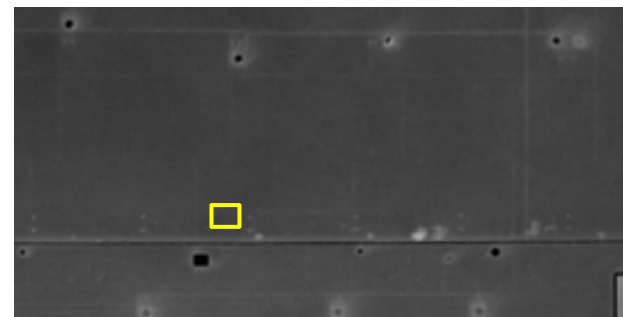
Date: 10/13/2016
Time: 8:39:57 PM
IR Image: IR_0353.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

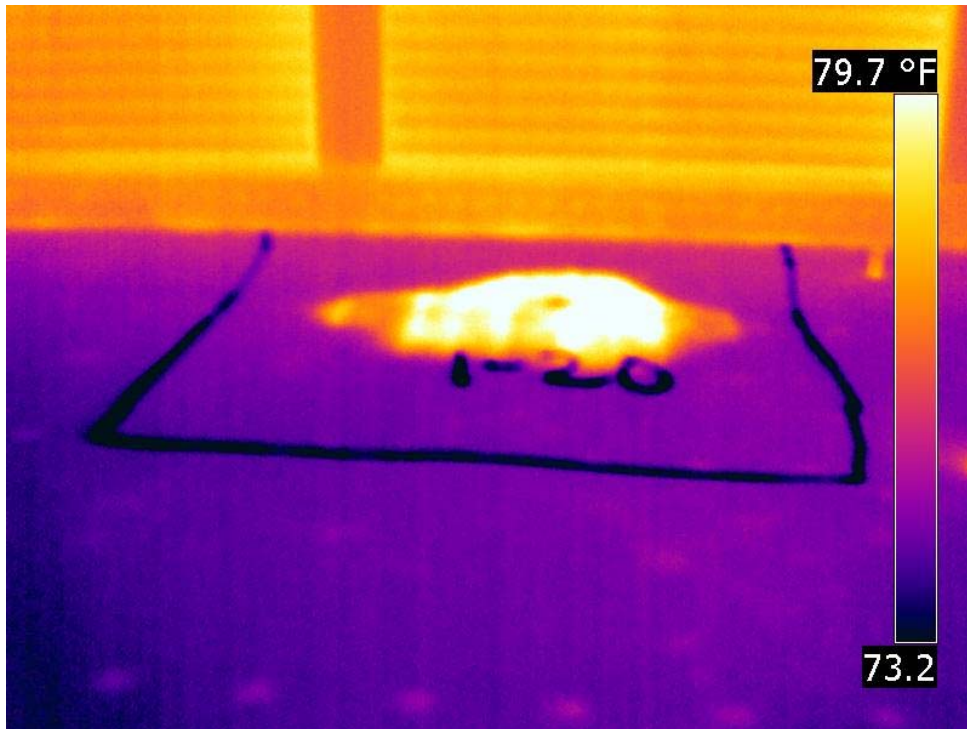


Yellow Box =
Location of Thermal
Anomaly



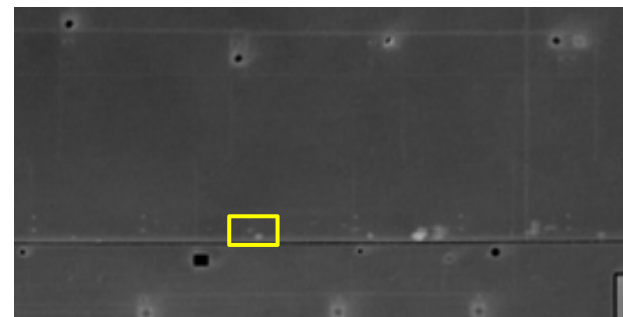
THERMOGRAM IMAGE – 1-20
Orange County Convention Center – Phase 1
Area 20 = 72 sq. ft.

Date: 10/13/2016
Time: 8:41:05 PM
IR Image: IR_0354.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture

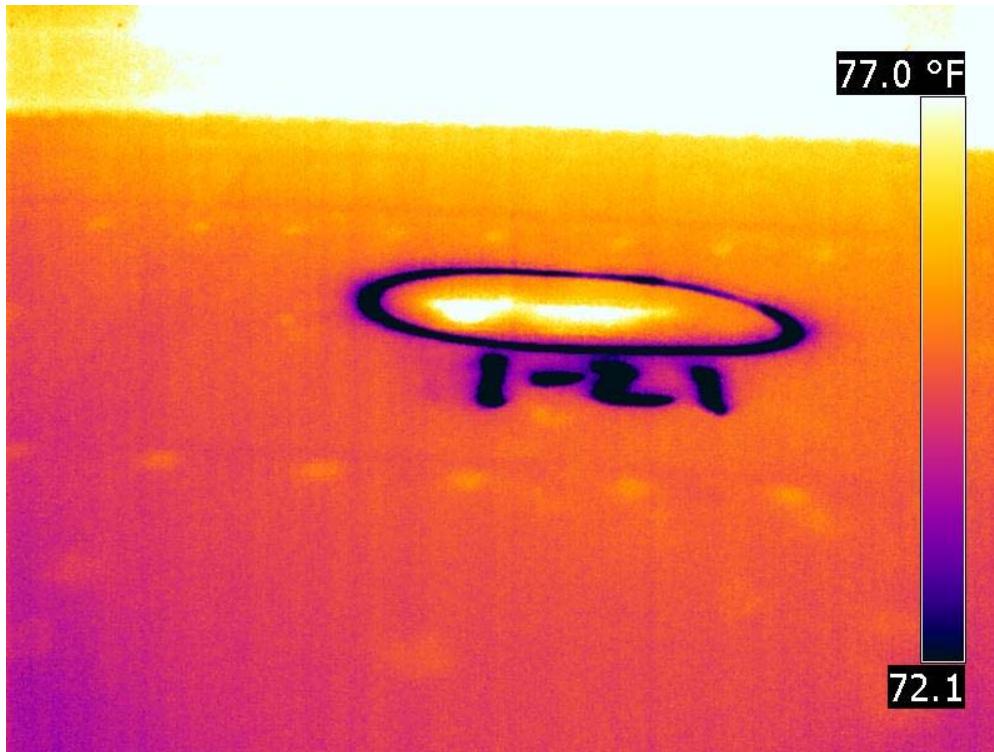


Yellow Box =
Location of Thermal
Anomaly



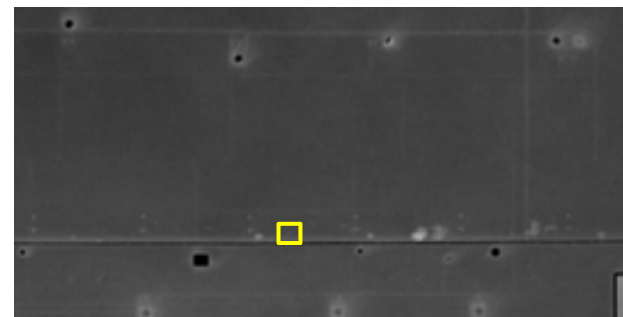
THERMOGRAM IMAGE – 1-21
Orange County Convention Center – Phase 1
Area 21 = 8 sq. ft.

Date: 10/13/2016
Time: 8:43:12 PM
IR Image: IR_0355.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture

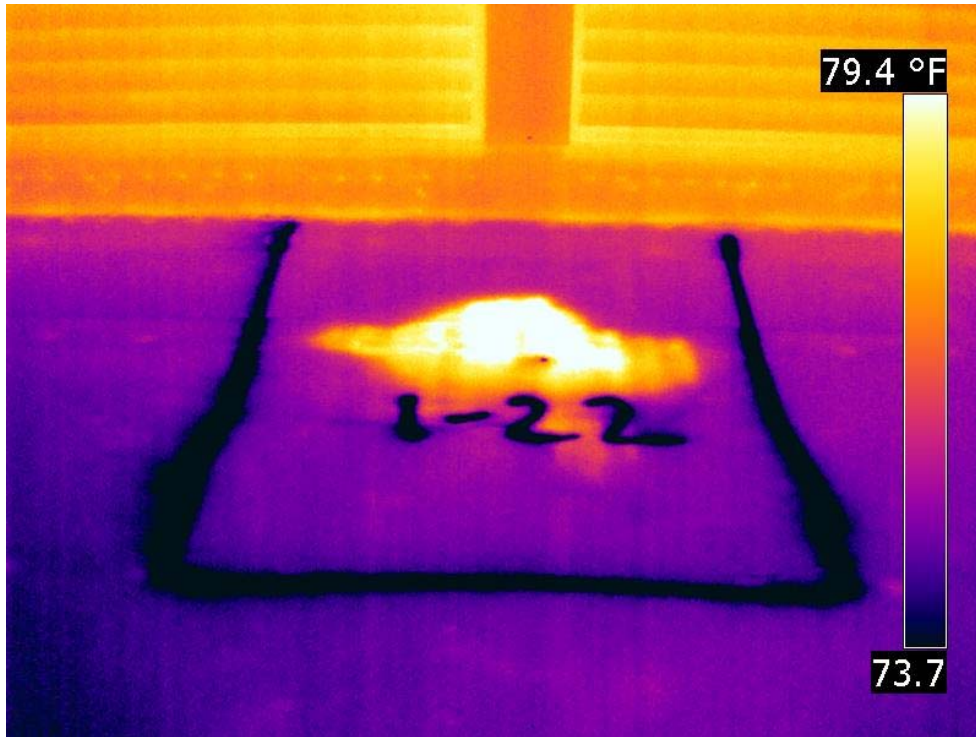


Yellow Box =
Location of Thermal
Anomaly



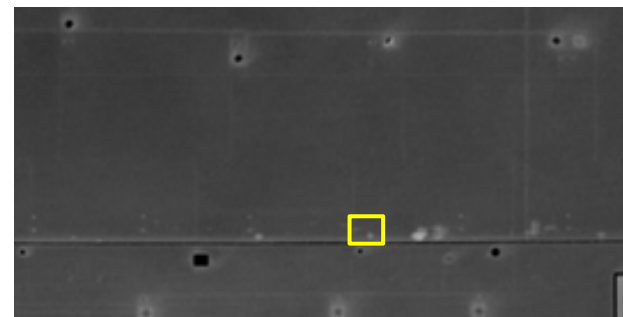
THERMOGRAM IMAGE – 1-22
Orange County Convention Center – Phase 1
Area 22 = 40 sq. ft.

Date: 10/13/2016
Time: 8:44:36 PM
IR Image: IR_0356.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture

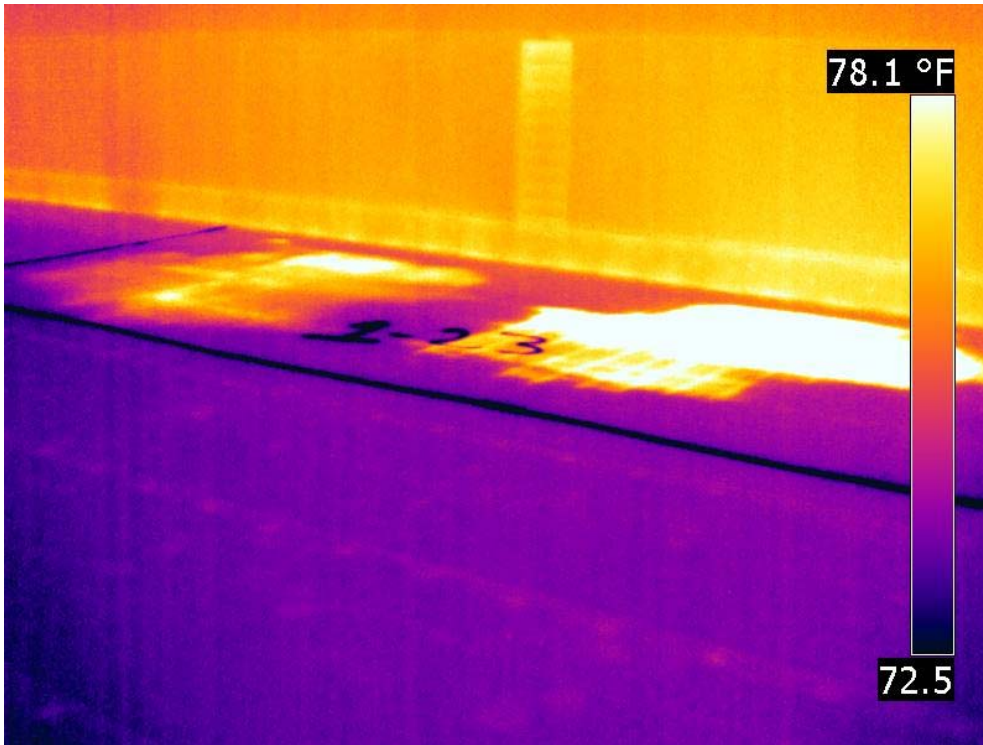


Yellow Box =
Location of Thermal
Anomaly



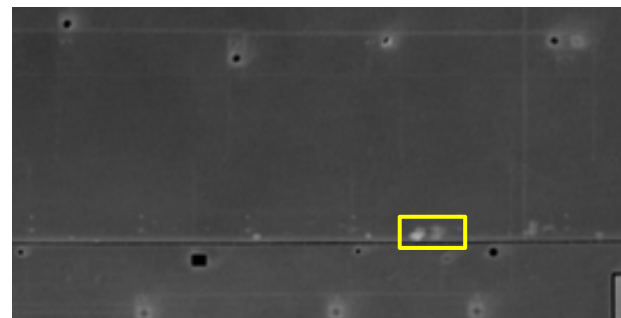
THERMOGRAM IMAGE – 1-23
Orange County Convention Center – Phase 1
Area 23 = 300 sq. ft.

Date: 10/13/2016
Time: 8:47:15 PM
IR Image: IR_0357.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture

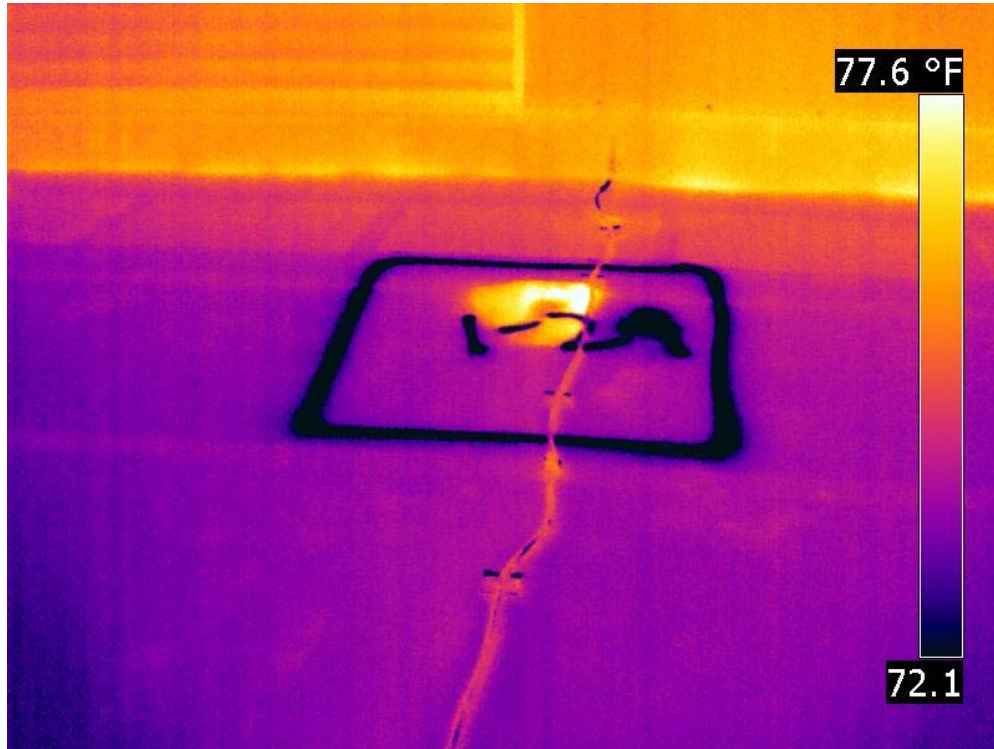


Yellow Box =
Location of Thermal
Anomaly



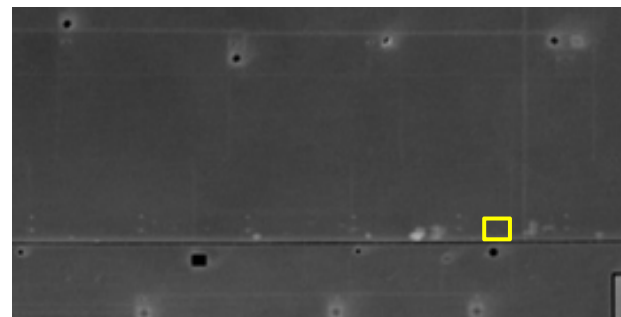
THERMOGRAM IMAGE – 1-24
Orange County Convention Center – Phase 1
Area 24 = 20 sq. ft.

Date: 10/13/2016
Time: 8:48:10 PM
IR Image: IR_0358.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture



Yellow Box =
Location of Thermal
Anomaly

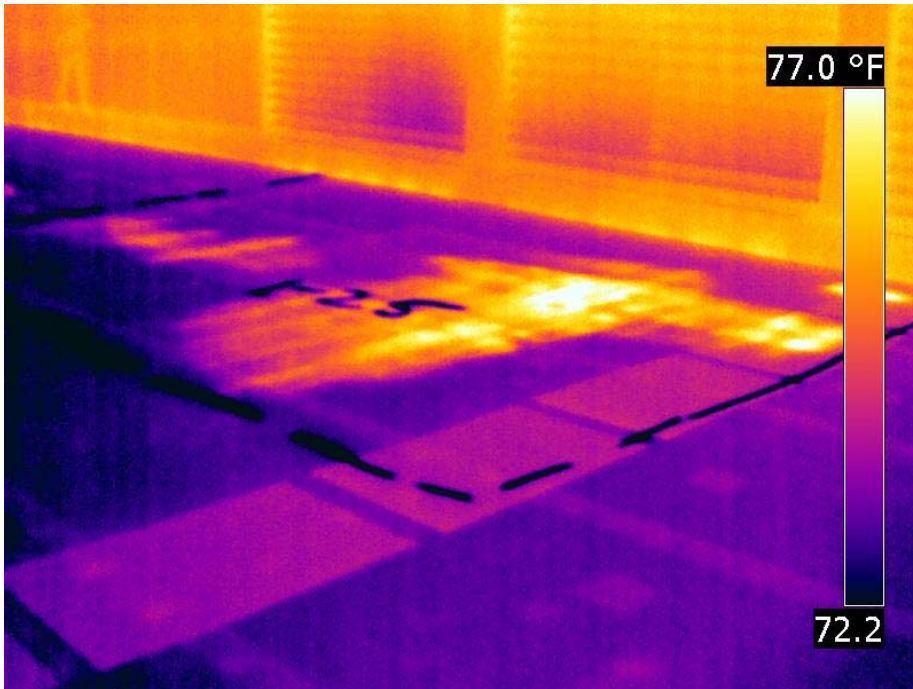


THERMOGRAM IMAGE – 1-25

Orange County Convention Center – Phase 1

Area 25 = 300 sq. ft.

Date: 10/13/2016
Time: 8:49:32 PM
IR Image: IR_0359.jpg



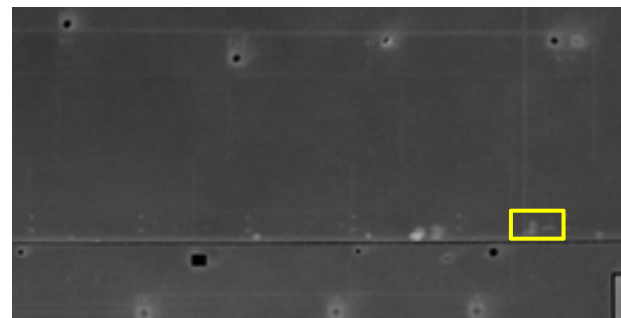
Infrared Image – light area shows location of trapped moisture



Visual Image



Visual image of wet core cut

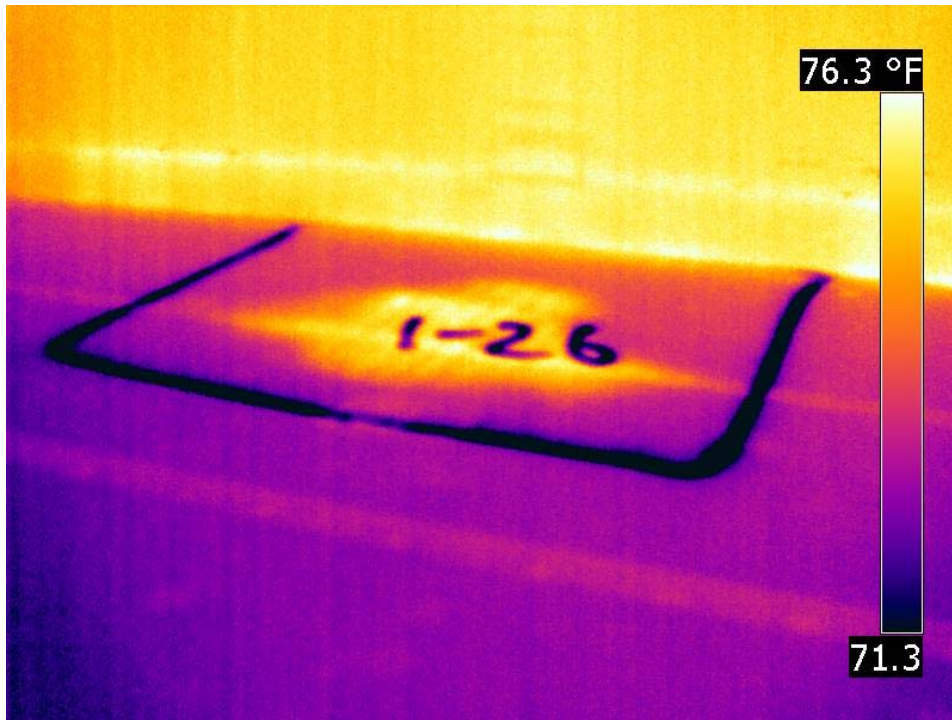


Yellow Box =
Location of Thermal
Anomaly



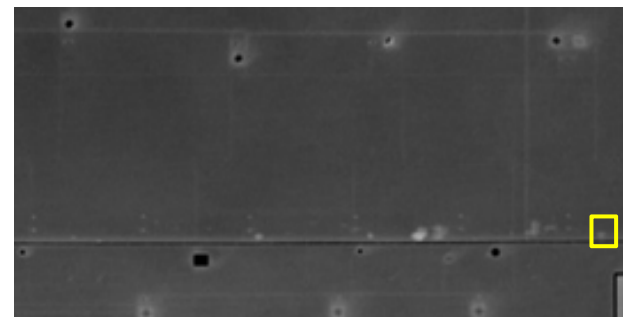
THERMOGRAM IMAGE – 1-26
Orange County Convention Center – Phase 1
Area 26 = 45 sq. ft.

Date: 10/13/2016
Time: 8:50:36 PM
IR Image: IR_0360.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture



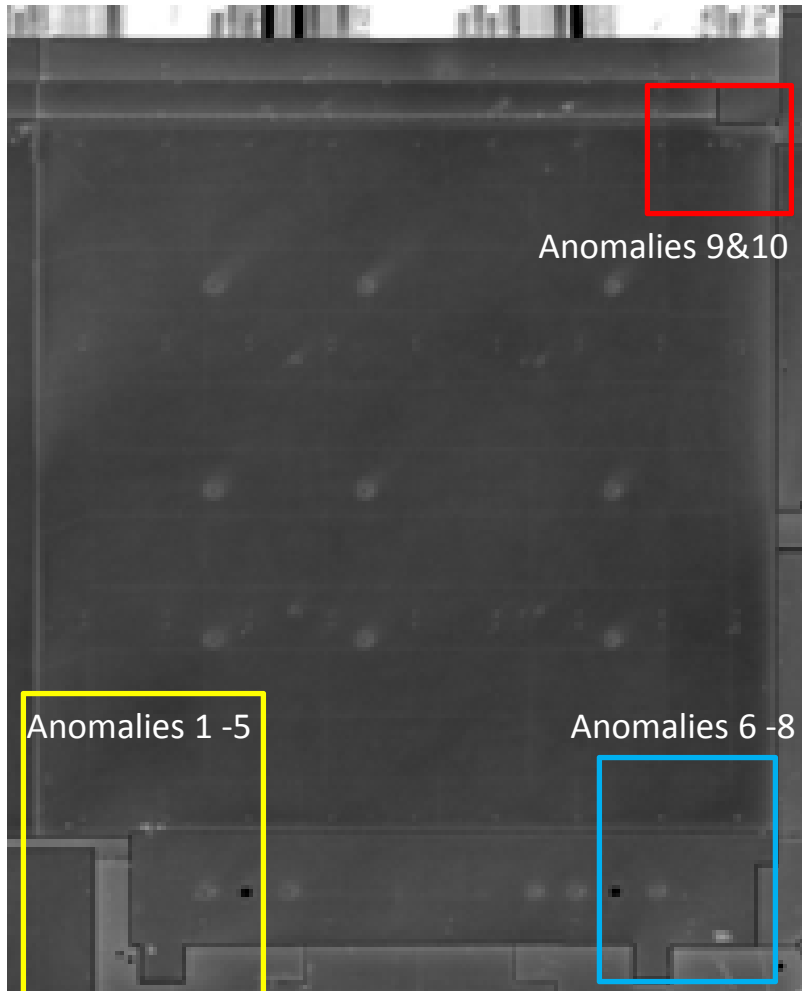
Yellow Box =
Location of Thermal
Anomaly

Appendix II

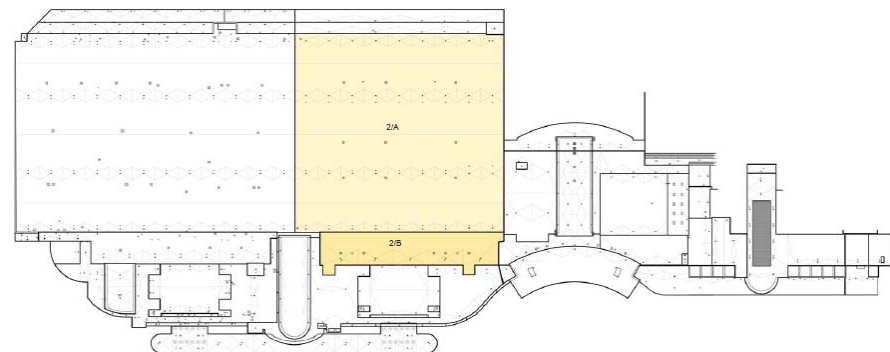
Phase II Roof Thermograms

Brady Infrared Inspections, Inc.

Phase-II Roof Anomaly Map



OCCC West Building Roof Repairs
Phase Identification Plan with Roof Areas



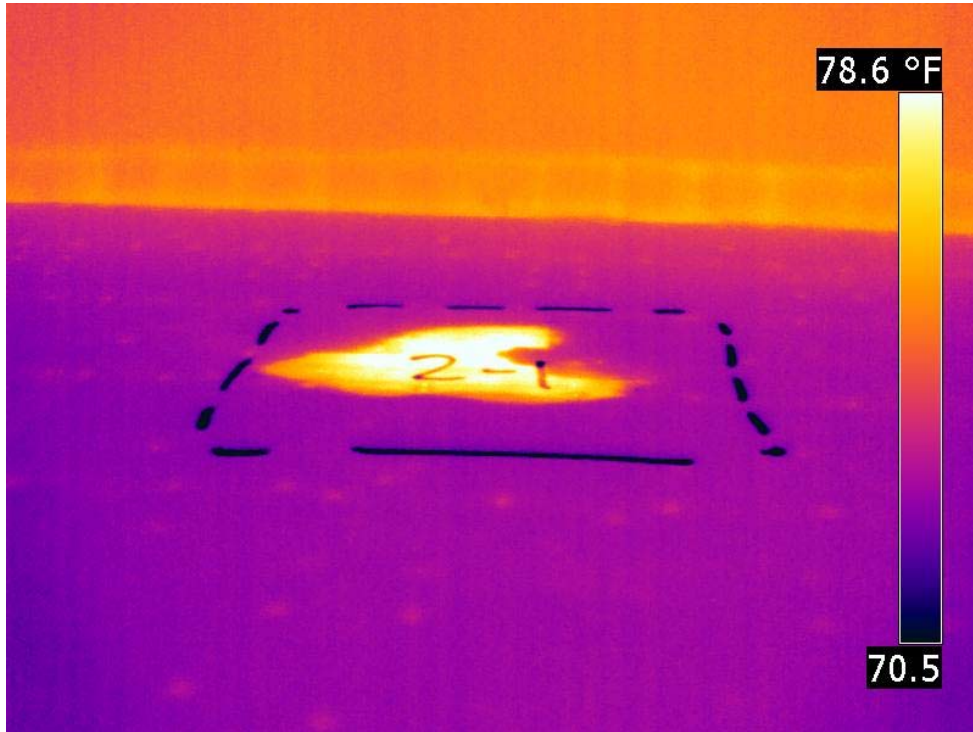


THERMOGRAM IMAGE – 2-1

Orange County Convention Center – Phase 2

Area 1 = 35 sq. ft.

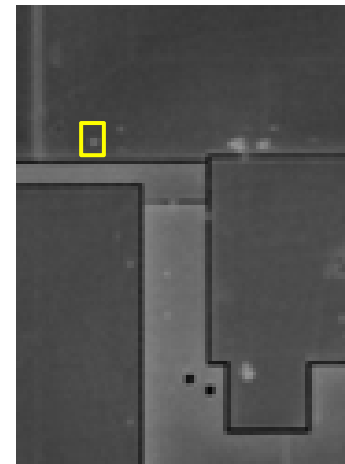
Date: 10/13/2016
Time: 9:14:44 PM
IR Image: IR_0366.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 2-2

Orange County Convention Center – Phase 2

Area 2 = 25 sq. ft.

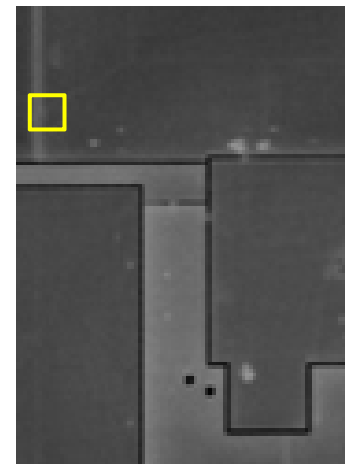
Date: 10/13/2016
Time: 9:18:05 PM
IR Image: IR_0367.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

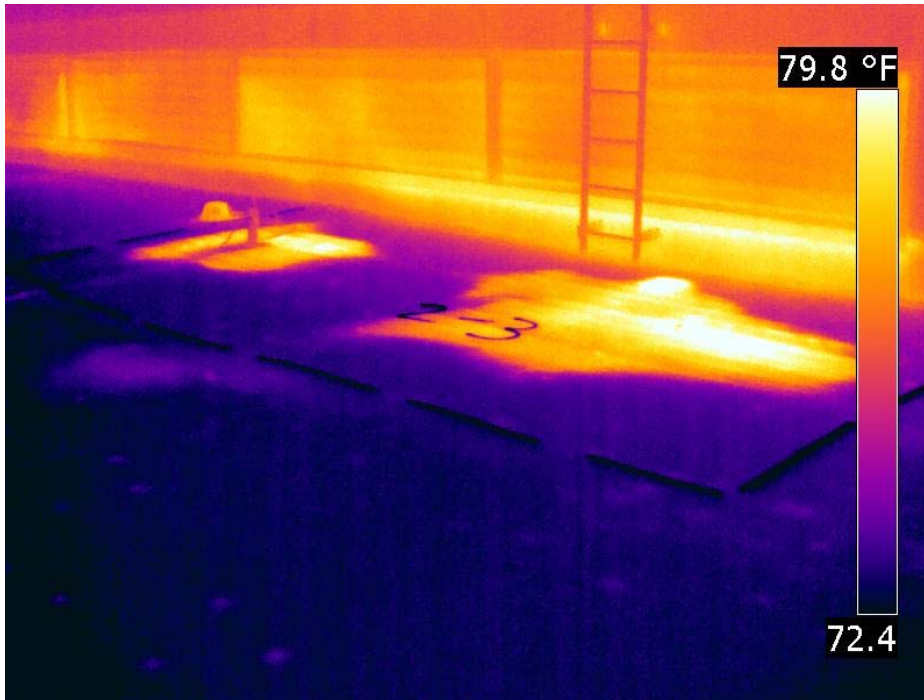


THERMOGRAM IMAGE – 2-3

Orange County Convention Center – Phase 2

Area 3 = 180 sq. ft.

Date: 10/13/2016
Time: 9:19:43 PM
IR Image: IR_0368.jpg



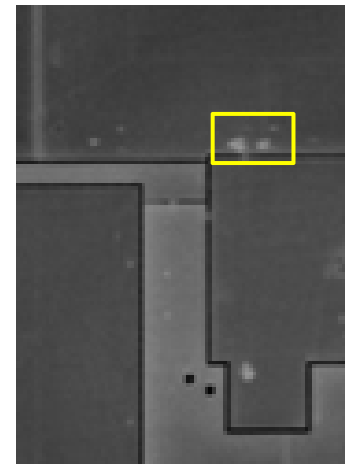
Infrared Image – light area shows location of trapped moisture



Visual Image



Visual image of wet core cut

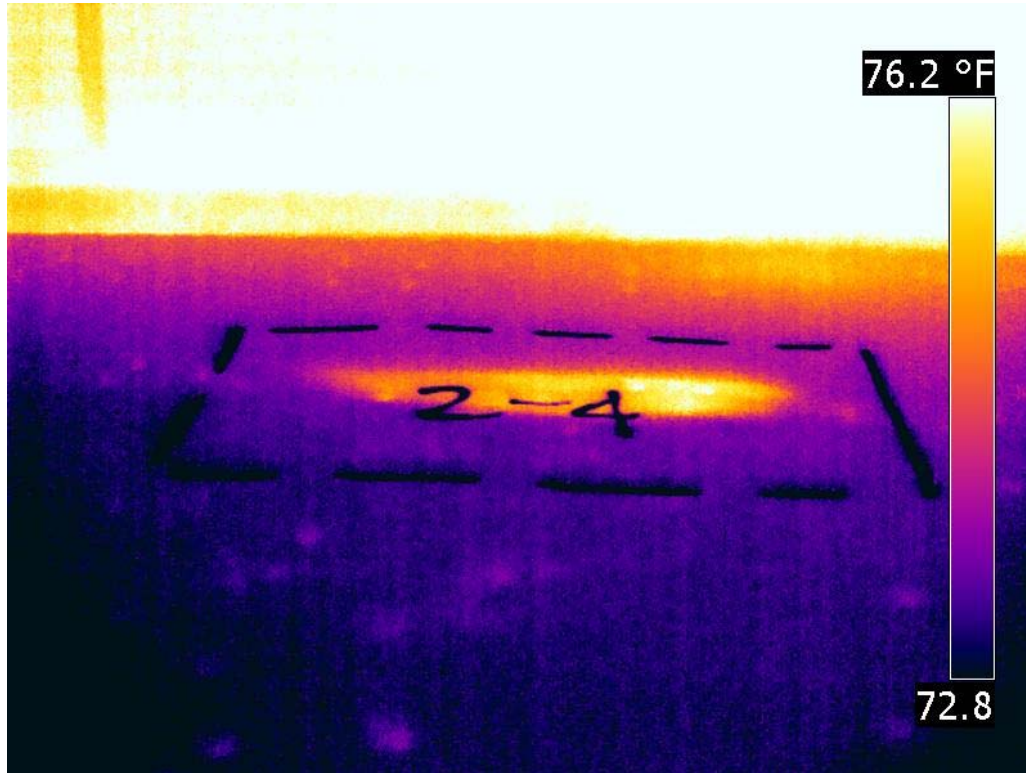


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 2-4
Orange County Convention Center – Phase 2
Area 4 = 32 sq. ft.

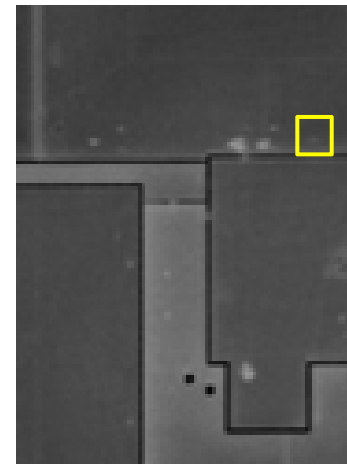
Date: 10/13/2016
Time: 9:20:45 PM
IR Image: IR_0369.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

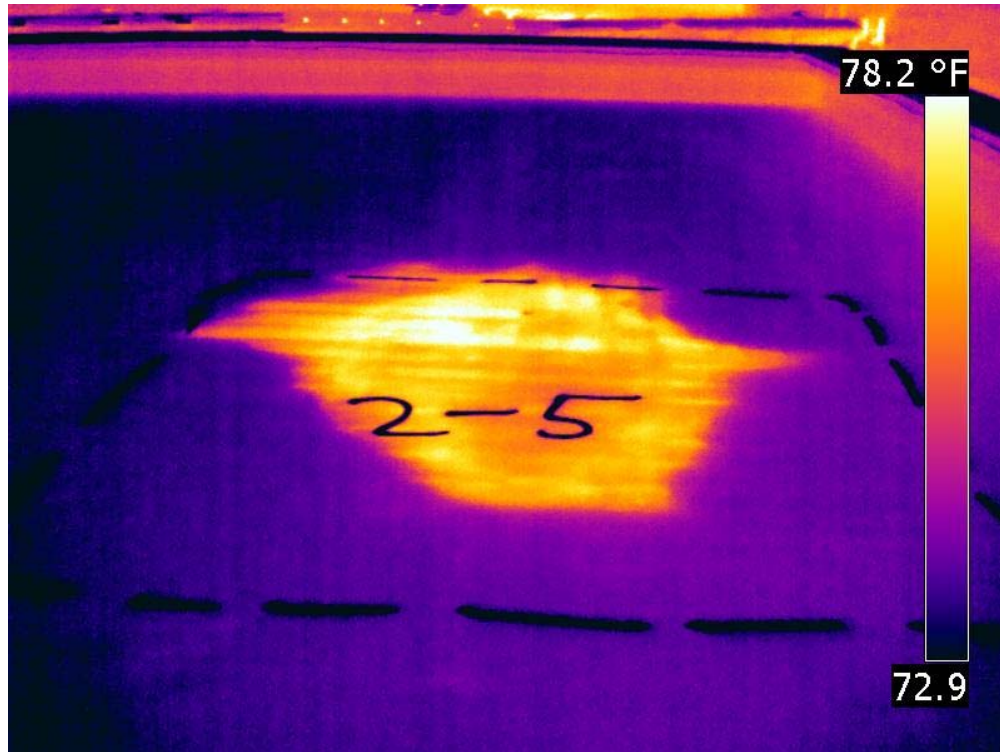


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 2-5
Orange County Convention Center – Phase 2
Area 5 = 72 sq. ft.

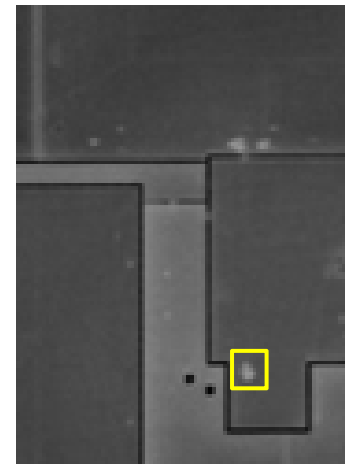
Date: 10/13/2016
Time: 9:24:40 PM
IR Image: IR_0370.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

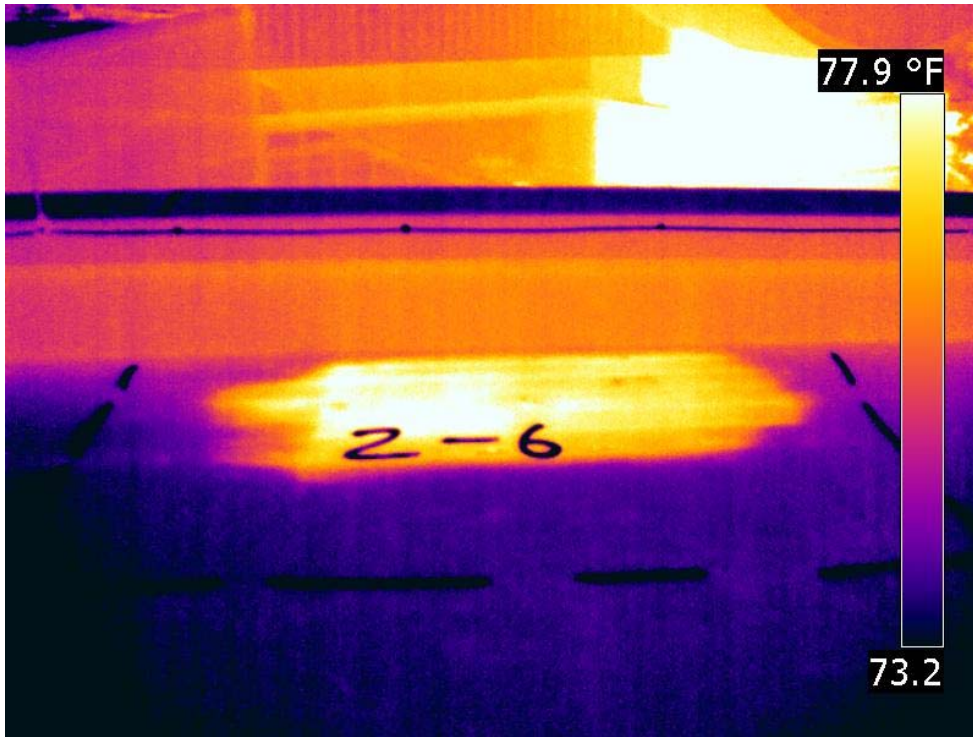


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 2-6
Orange County Convention Center – Phase 2
Area 6 = 54 sq. ft.

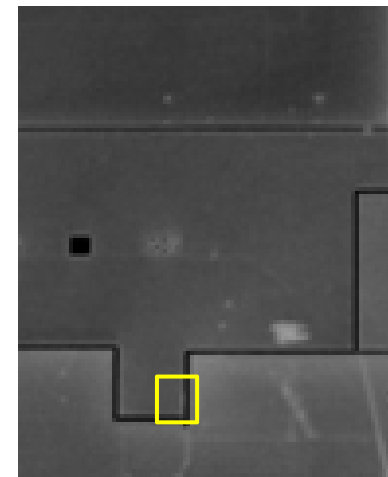
Date: 10/13/2016
Time: 9:27:23 PM
IR Image: IR_0372.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

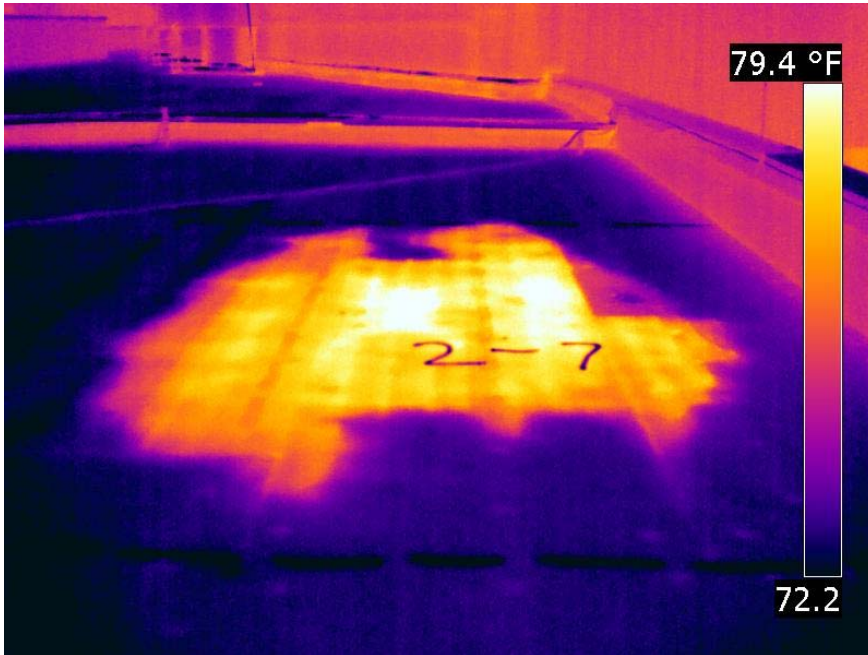


THERMOGRAM IMAGE – 2-7

Orange County Convention Center – Phase 2

Area 7 = 221 sq. ft.

Date: 10/13/2016
Time: 9:28:57 PM
IR Image: IR_0373.jpg

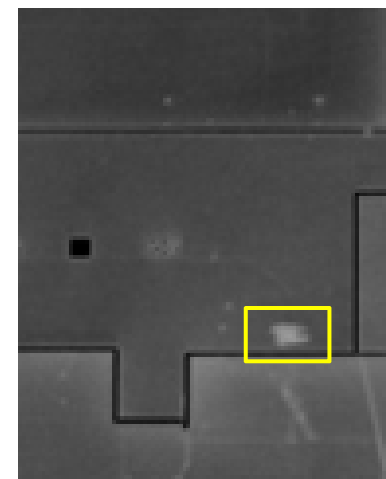


Visual Image

Infrared Image – light area shows location of trapped moisture



Visual image of wet core cut

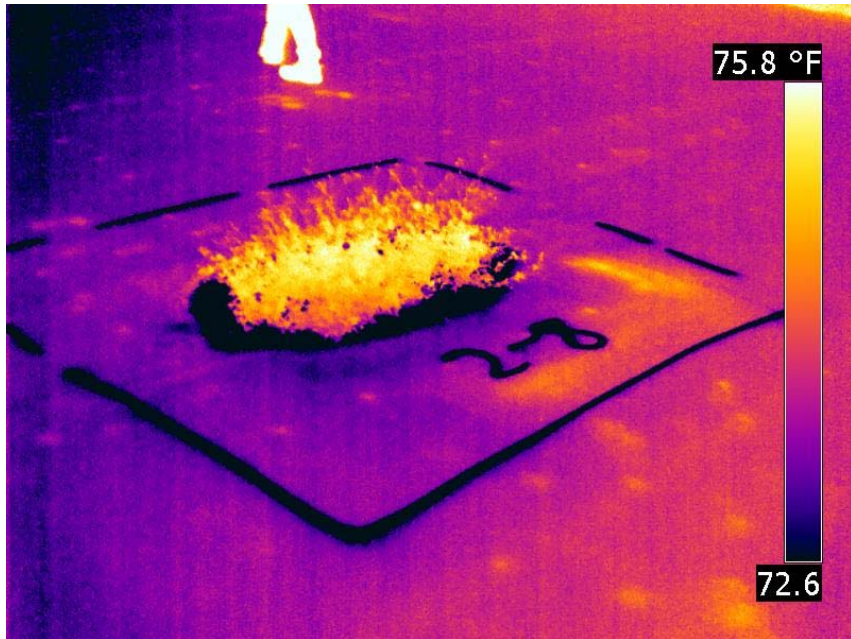


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 2-8
Orange County Convention Center – Phase 2
Area 8 = 64 sq. ft.

Date: 10/13/2016
Time: 9:54:07 PM
IR Image: IR_0375.jpg

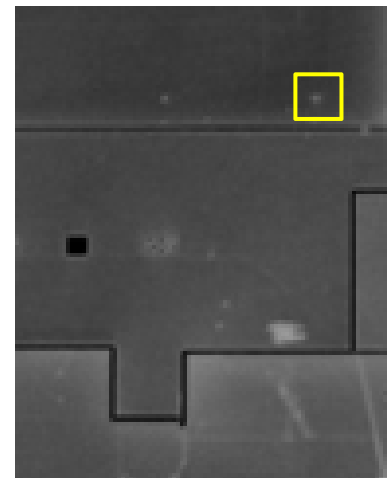


Visual Image

Infrared Image – light area shows location of trapped moisture



Visual image hole in roof

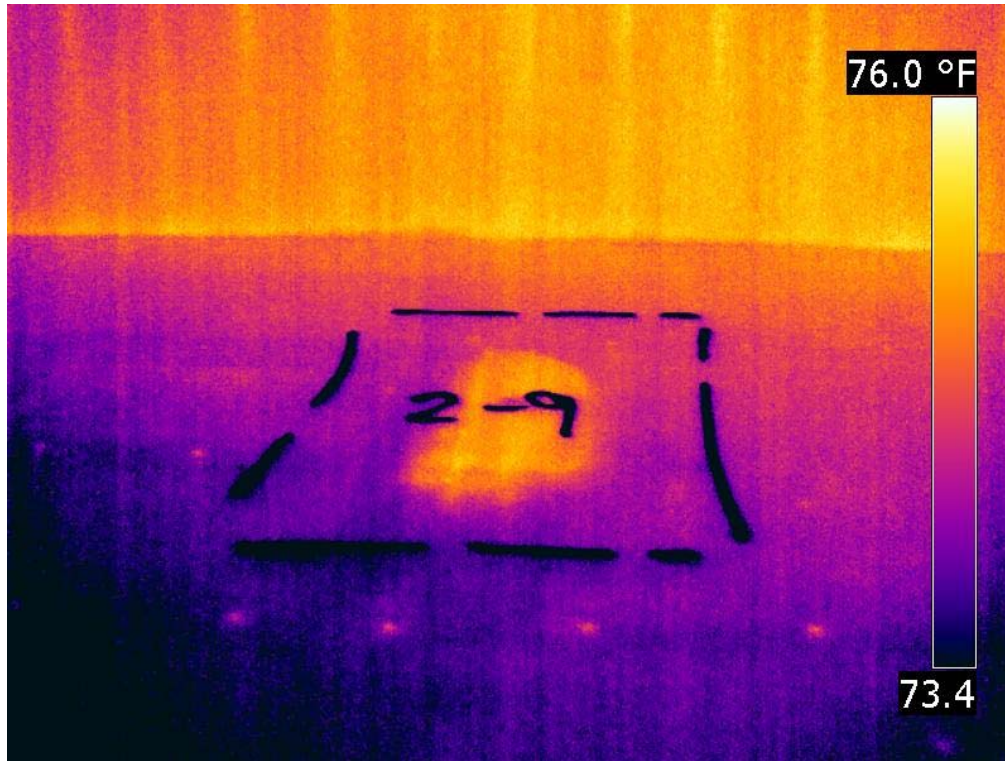


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 2-9
Orange County Convention Center – Phase 2
Area 9 = 32 sq. ft.

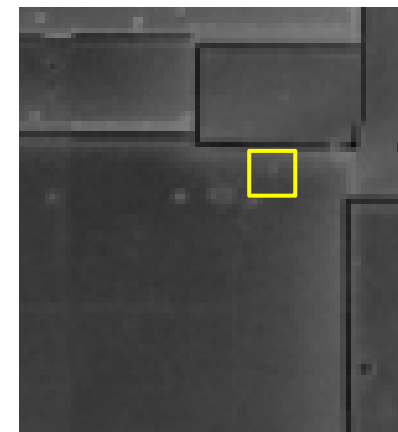
Date: 10/13/2016
Time: 9:58:52 PM
IR Image: IR_0376.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

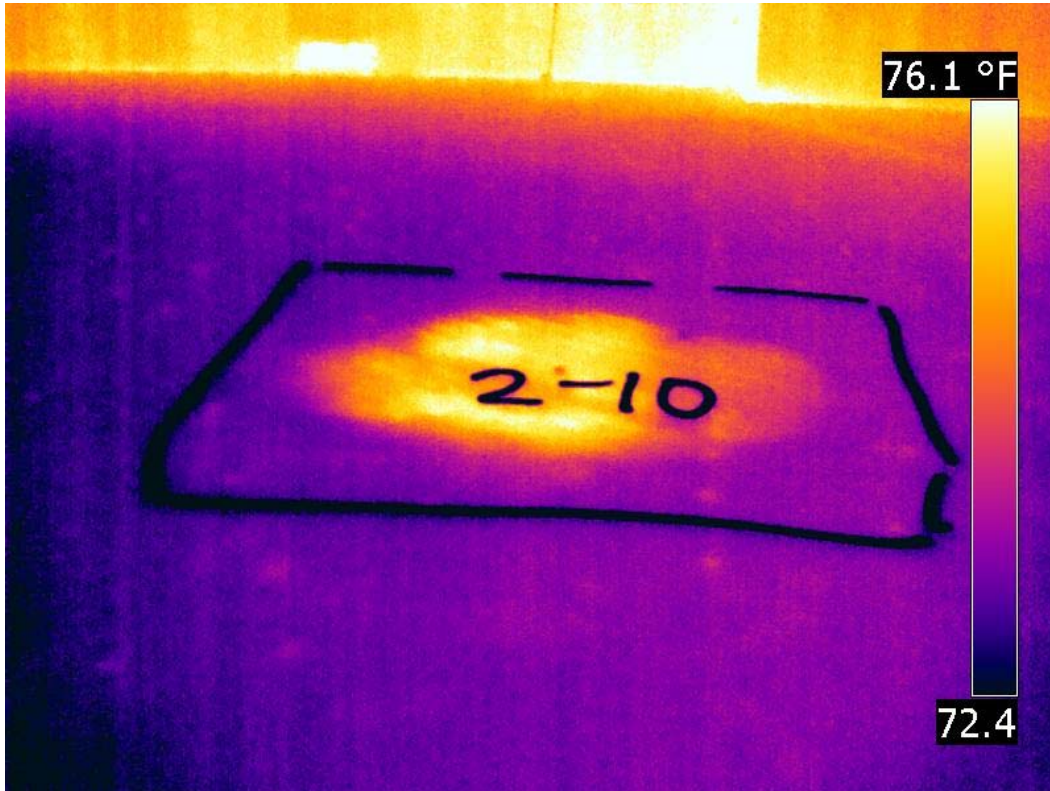


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 2-10
Orange County Convention Center – Phase 2
Area 10 = 64 sq. ft.

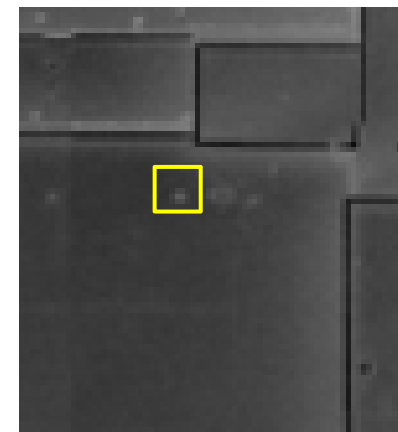
Date: 10/13/2016
Time: 10:00:02 PM
IR Image: IR_0377.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



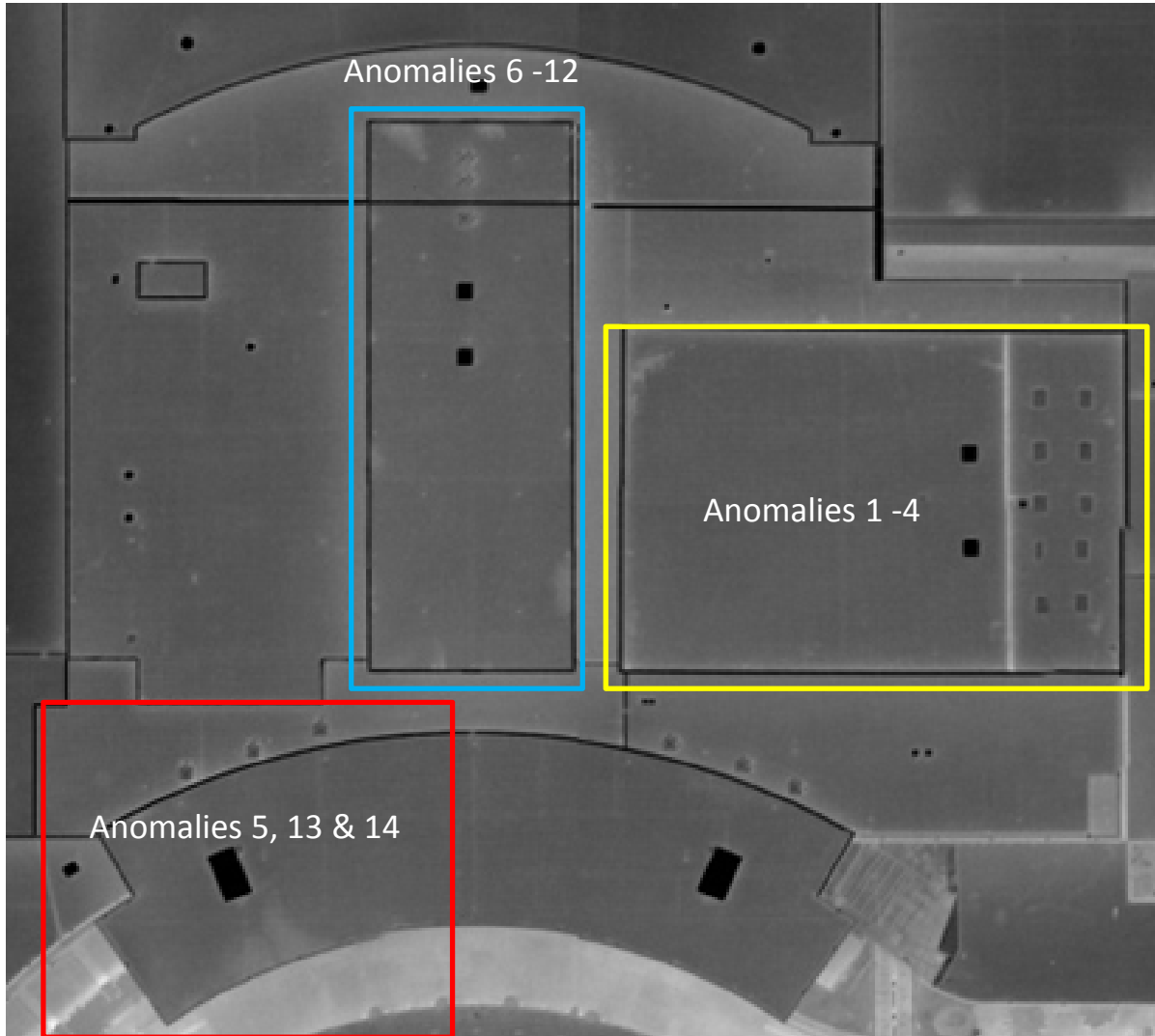
Yellow Box =
Location of Thermal
Anomaly

Appendix III

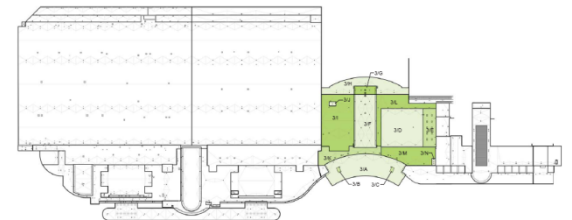
Phase III Roof Thermograms

Brady Infrared Inspections, Inc.

Phase-III Roof Anomaly Map



 OCCC West Building Roof Repairs
Phase Identification Plan



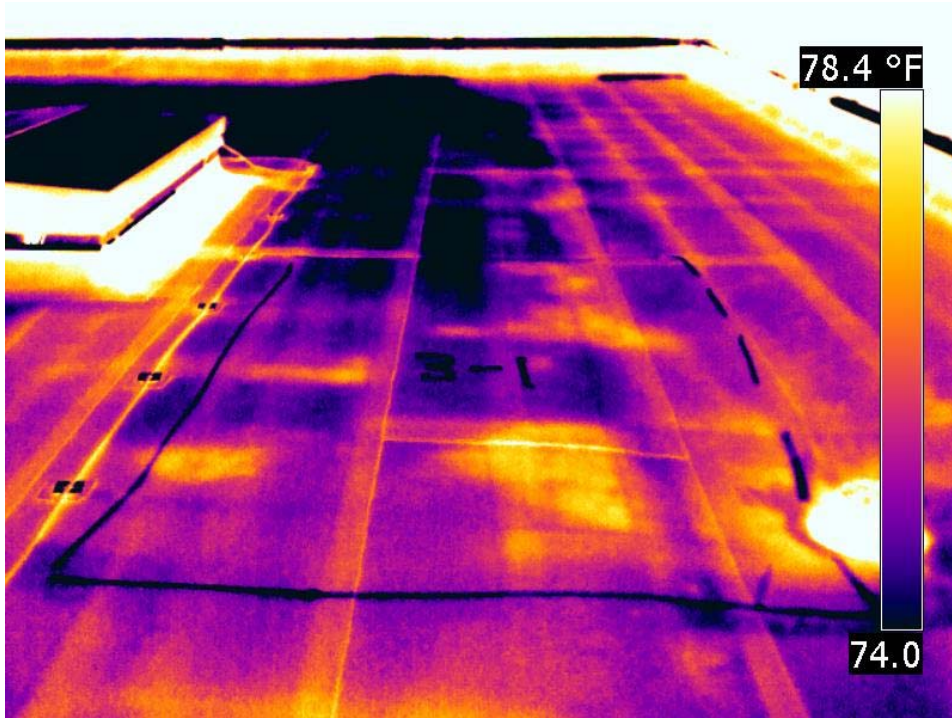


THERMOGRAM IMAGE – 3-1

Orange County Convention Center – Phase 3

Area 1 = 18 sq. ft.

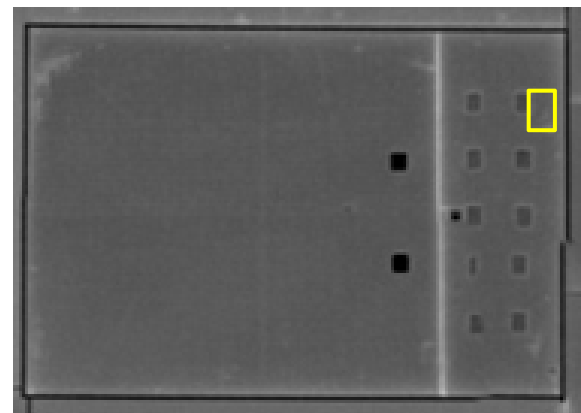
Date: 10/17/2016
Time: 6:43:27 PM
IR Image: IR_0389.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

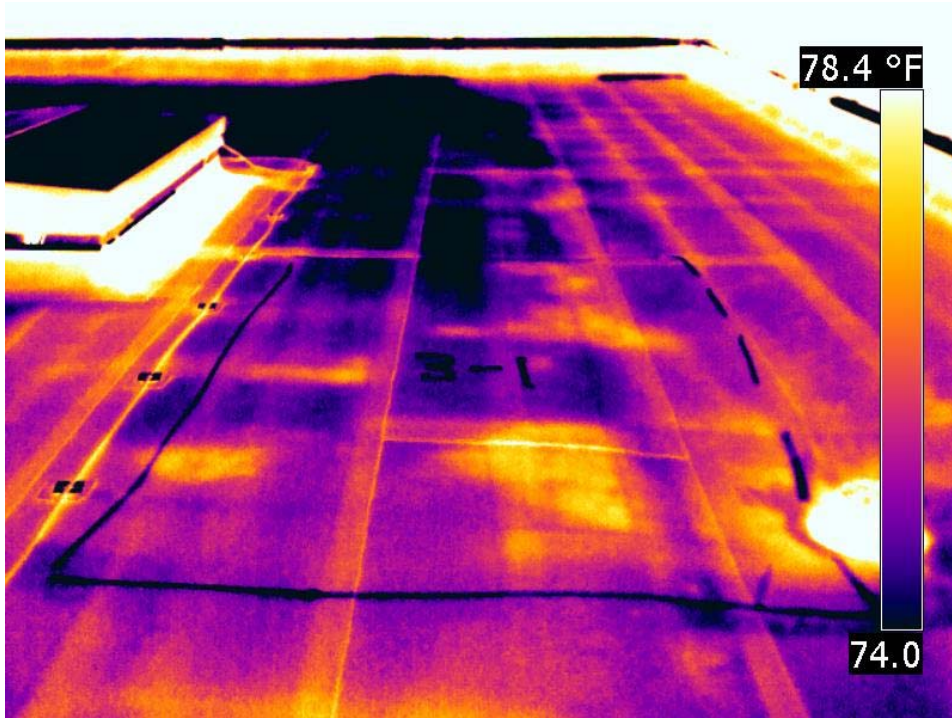


THERMOGRAM IMAGE – 3-2

Orange County Convention Center – Phase 3

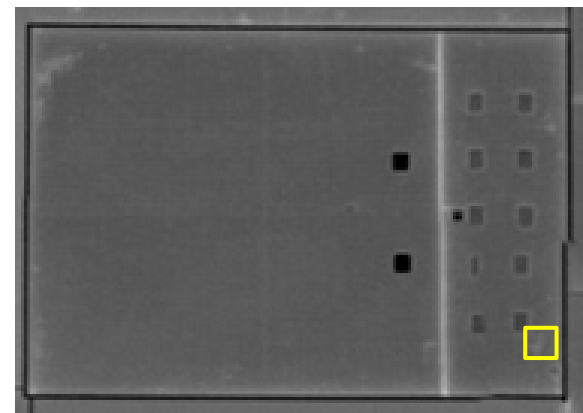
Area 2 = 20 sq. ft.

Date: 10/17/2016
Time: 6:47:34 PM
IR Image: IR_0390.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture



Yellow Box =
Location of Thermal
Anomaly

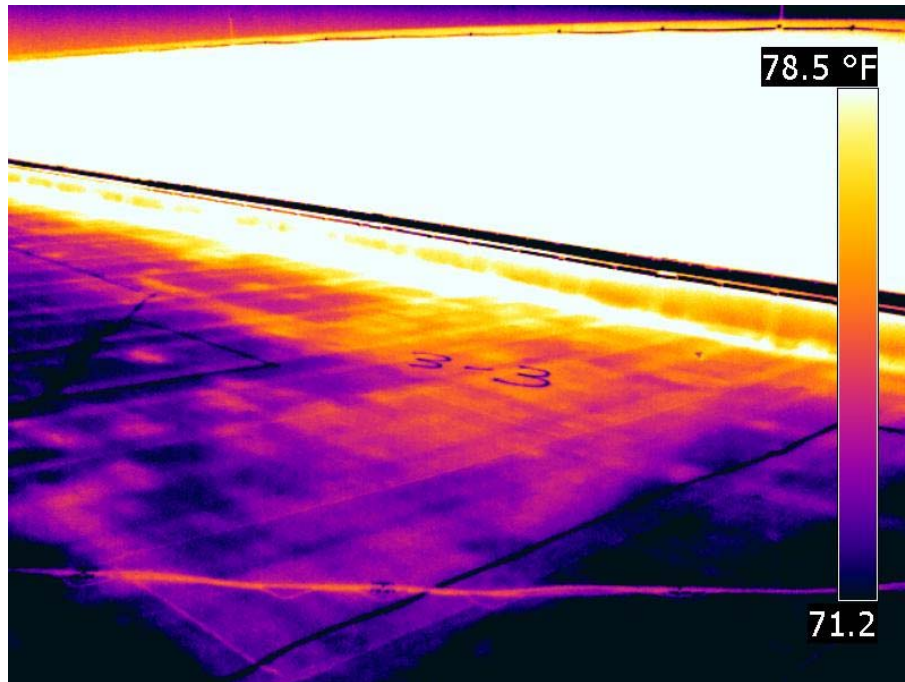


THERMOGRAM IMAGE – 3-3

Orange County Convention Center – Phase 3

Area 3 = 400 sq. ft.

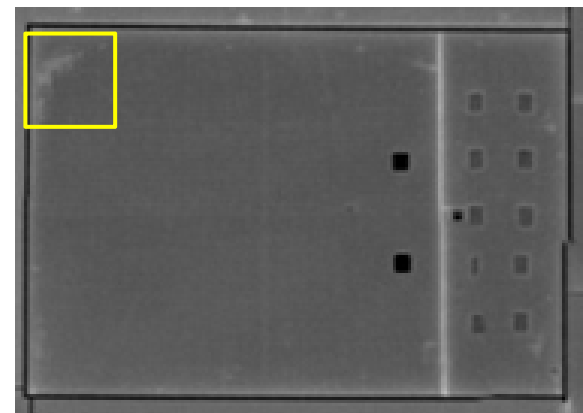
Date: 10/17/2016
Time: 7:12:20 PM
IR Image: IR_0391.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly



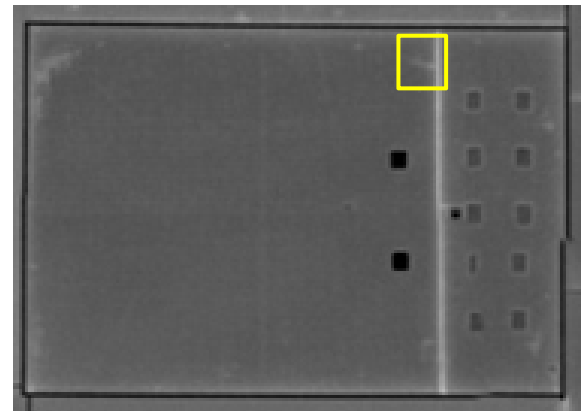
THERMOGRAM IMAGE – 3-4

Orange County Convention Center – Phase 3

Date: 10/17/2016
Time: 7:16 PM
Image: 747



Visual Image of ponding water on roof



Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 3-5

Orange County Convention Center – Phase 3

Area 5 = 40 sq. ft.

Date: 10/17/2016
Time: 7:46:20 PM
IR Image: IR_0392.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture



Yellow Box =
Location of Thermal
Anomaly

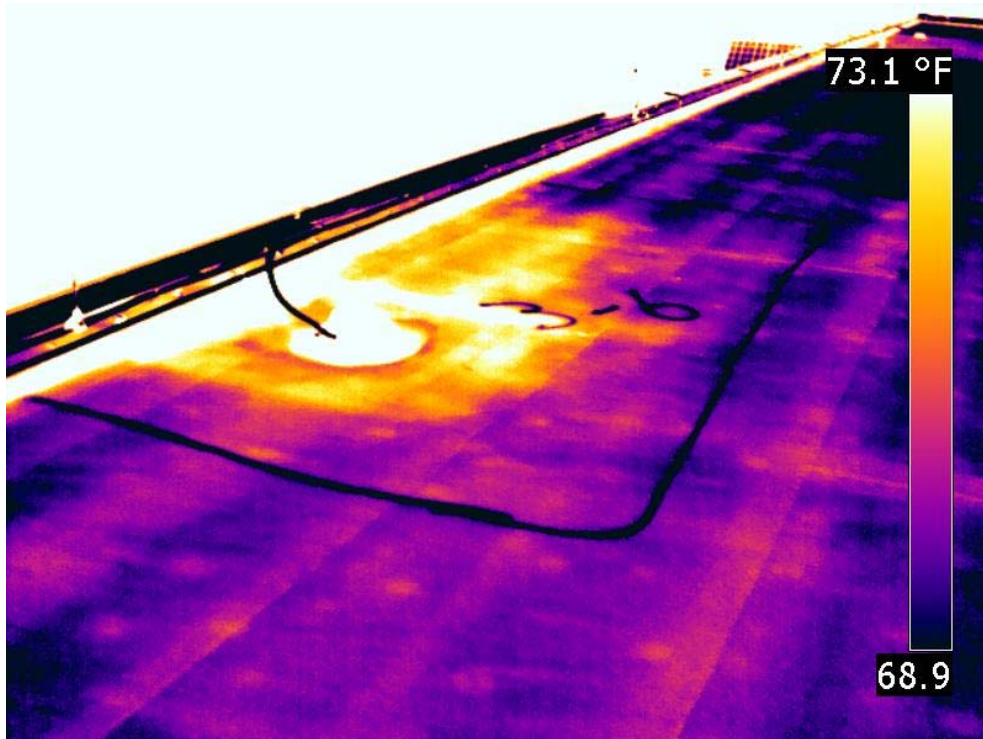


THERMOGRAM IMAGE – 3-6

Orange County Convention Center – Phase 3

Area 6 = 60 sq. ft.

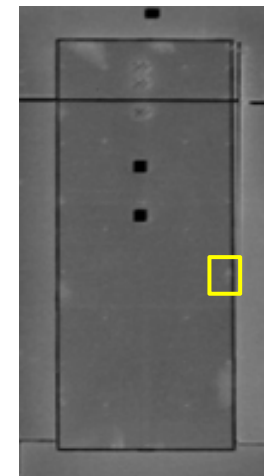
Date: 10/17/2016
Time: 8:01:26 PM
IR Image: IR_0393.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

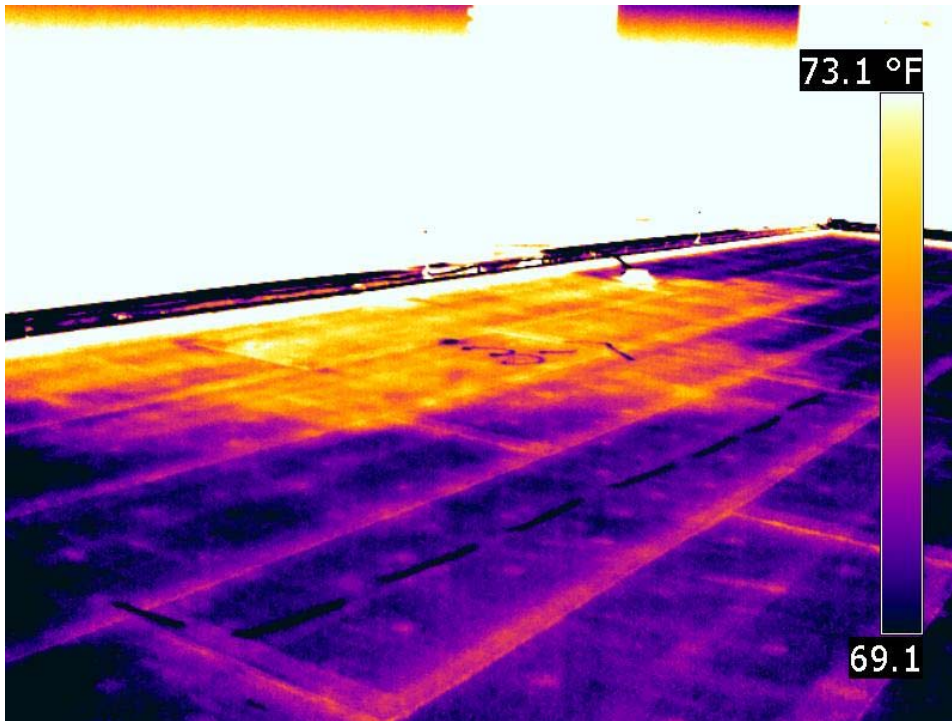


THERMOGRAM IMAGE – 3-7

Orange County Convention Center – Phase 3

Area 7 = 300 sq. ft.

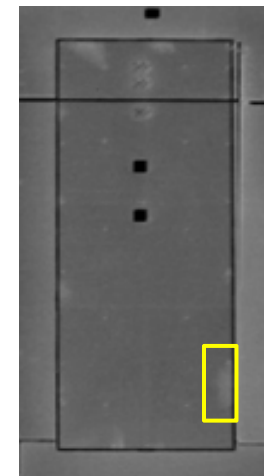
Date: 10/17/2016
Time: 8:04:36 PM
IR Image: IR_0394.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

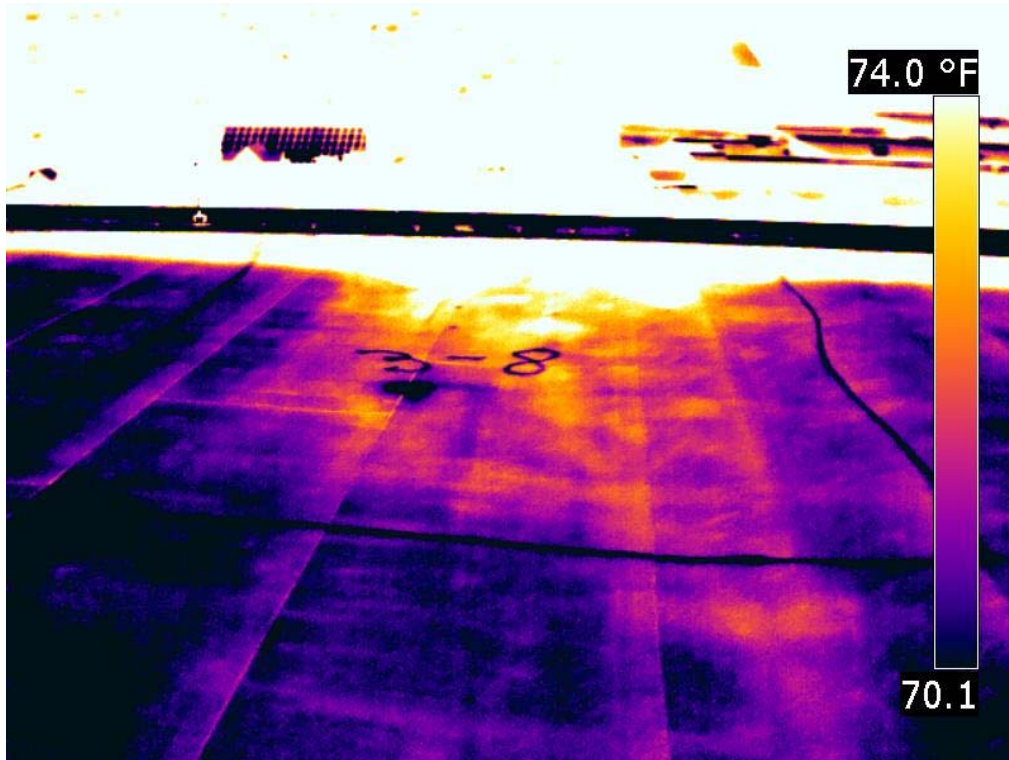


THERMOGRAM IMAGE – 3-8

Orange County Convention Center – Phase 3

Area 8 = 120 sq. ft.

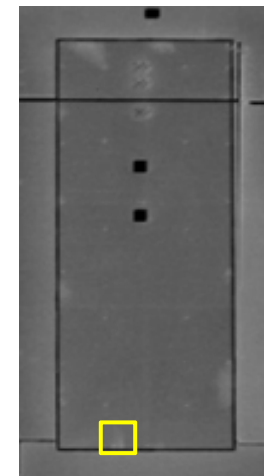
Date: 10/17/2016
Time: 8:06:35 PM
IR Image: IR_0395.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 3-9

Orange County Convention Center – Phase 3

Area 9 = 106 sq. ft.

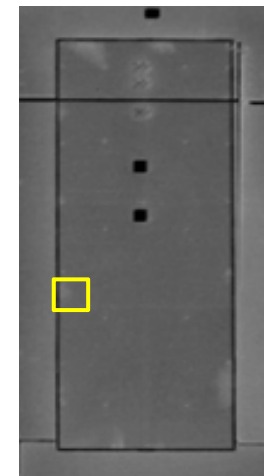
Date: 10/17/2016
Time: 8:09:42 PM
IR Image: IR_0396.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

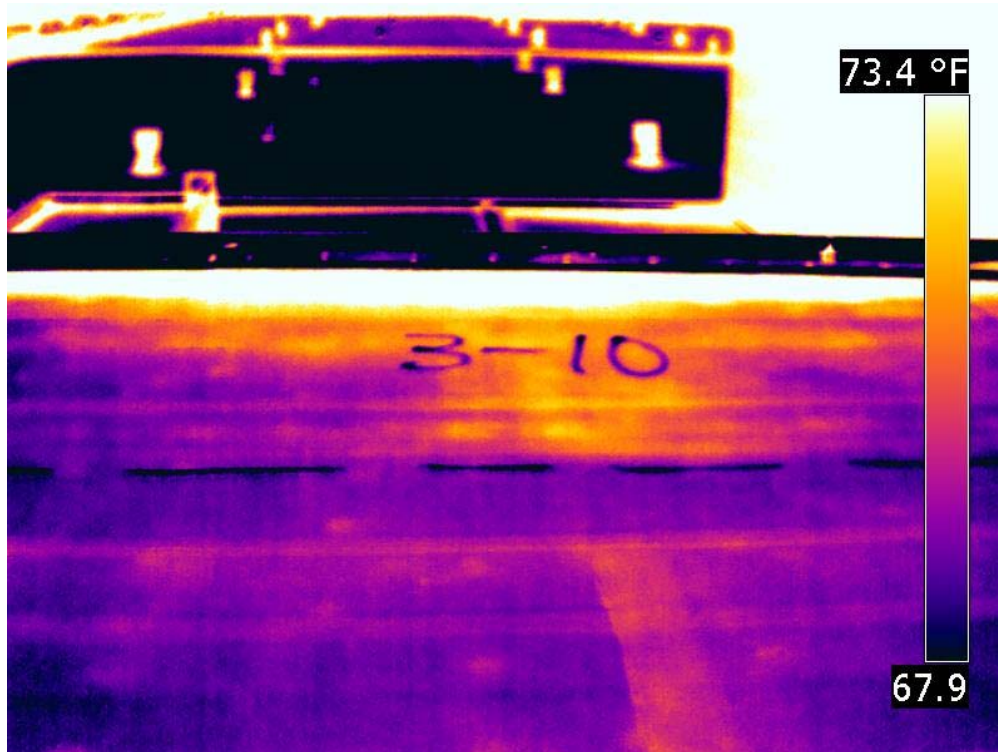


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 3-10
Orange County Convention Center – Phase 3
Area 10 = 50 sq. ft.

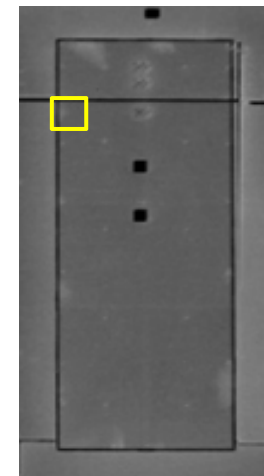
Date: 10/17/2016
Time: 8:13:12 PM
IR Image: IR_0397.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

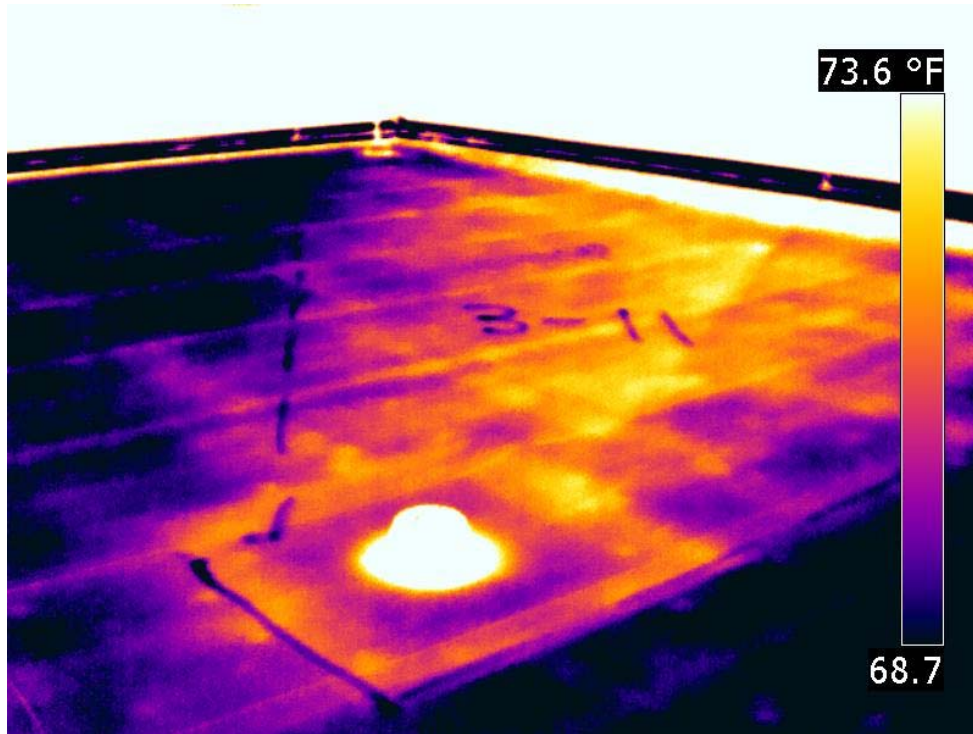


THERMOGRAM IMAGE – 3-11

Orange County Convention Center – Phase 3

Area 11 = 465 sq. ft.

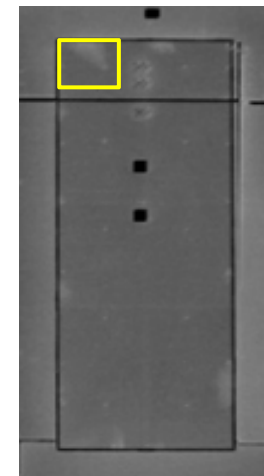
Date: 10/17/2016
Time: 8:16:12 PM
IR Image: IR_0398.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

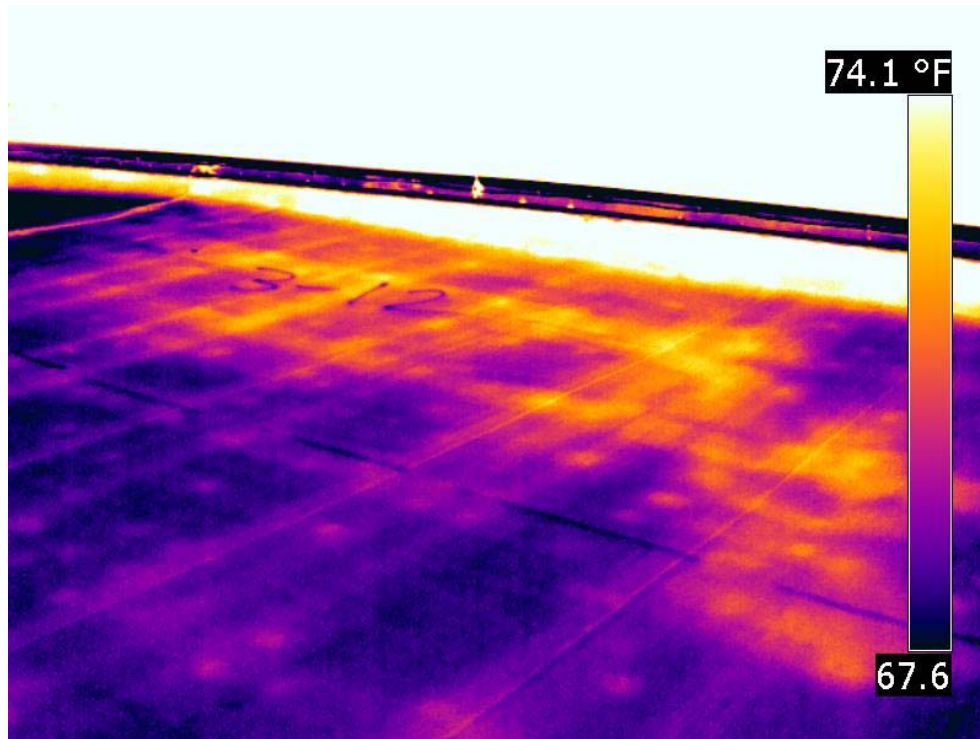


THERMOGRAM IMAGE – 3-12

Orange County Convention Center – Phase 3

Area 12 = 120 sq. ft.

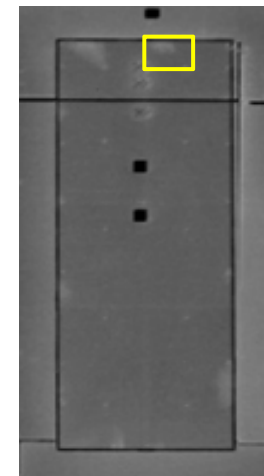
Date: 10/17/2016
Time: 8:17:45 PM
IR Image: IR_0399.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

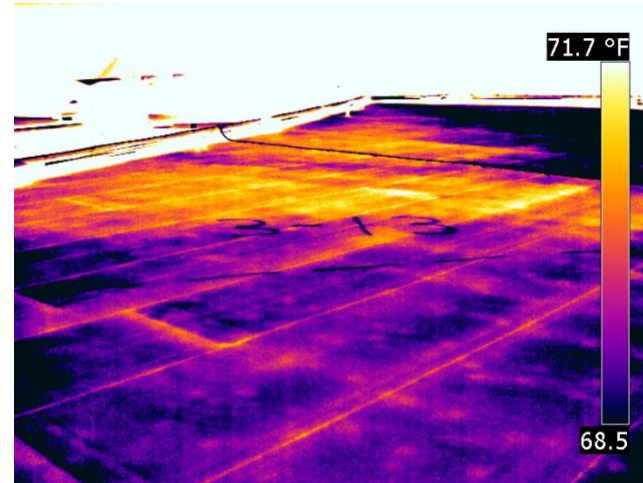


Yellow Box =
Location of Thermal
Anomaly

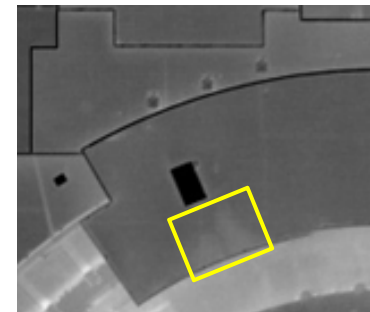
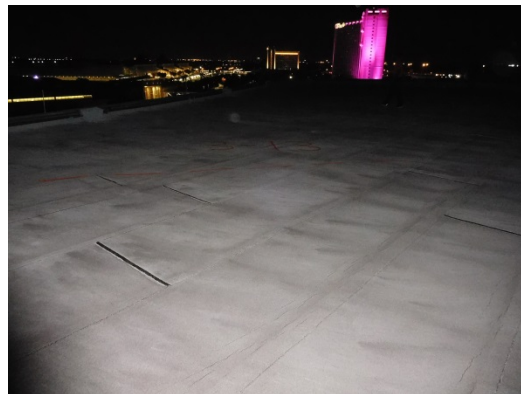


THERMOGRAM IMAGE – 3-13
Orange County Convention Center – Phase 3
Area 13 = 975 sq. ft.

Date: 10/17/2016
Time: 8:37:09 PM
IR Image: IR_0400.jpg
IR_0401.jpg



Infrared Image – light area shows location of trapped moisture



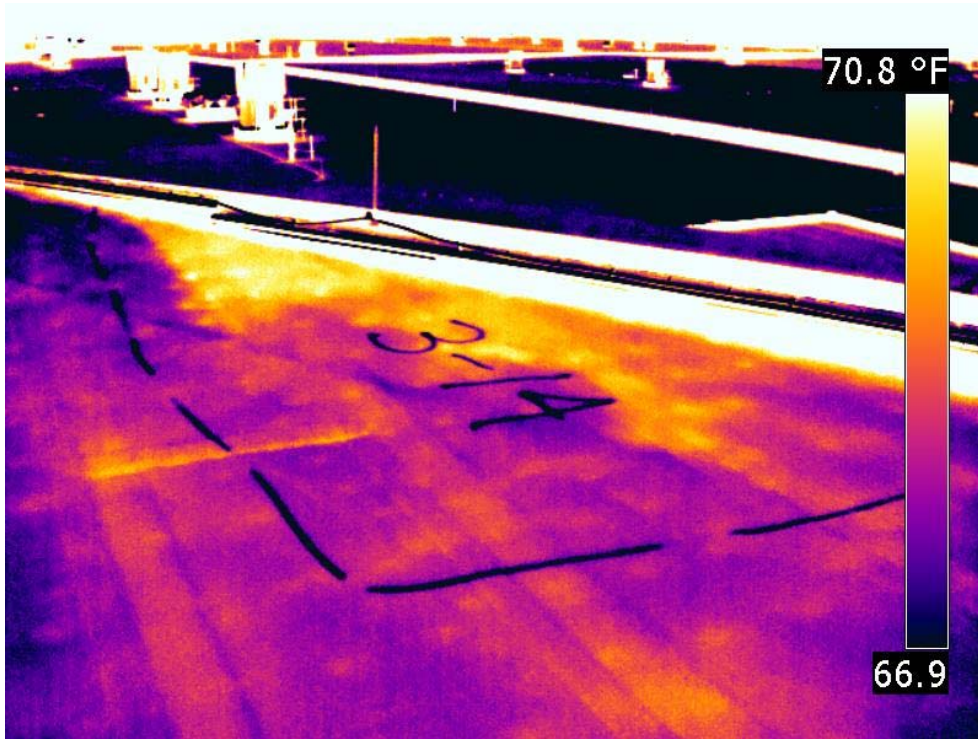
Yellow Box =
Location of
Thermal
Anomaly

Visual Image



THERMOGRAM IMAGE – 3-14
Orange County Convention Center – Phase 3
Area 14 = 8 sq. ft.

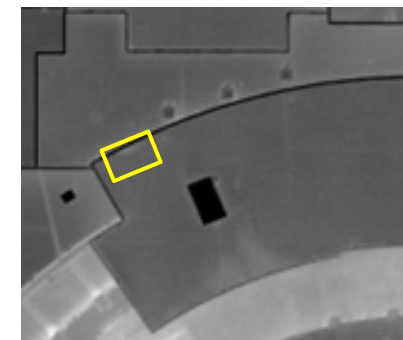
Date: 10/17/2016
Time: 8:41:05 PM
IR Image: IR_0402.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



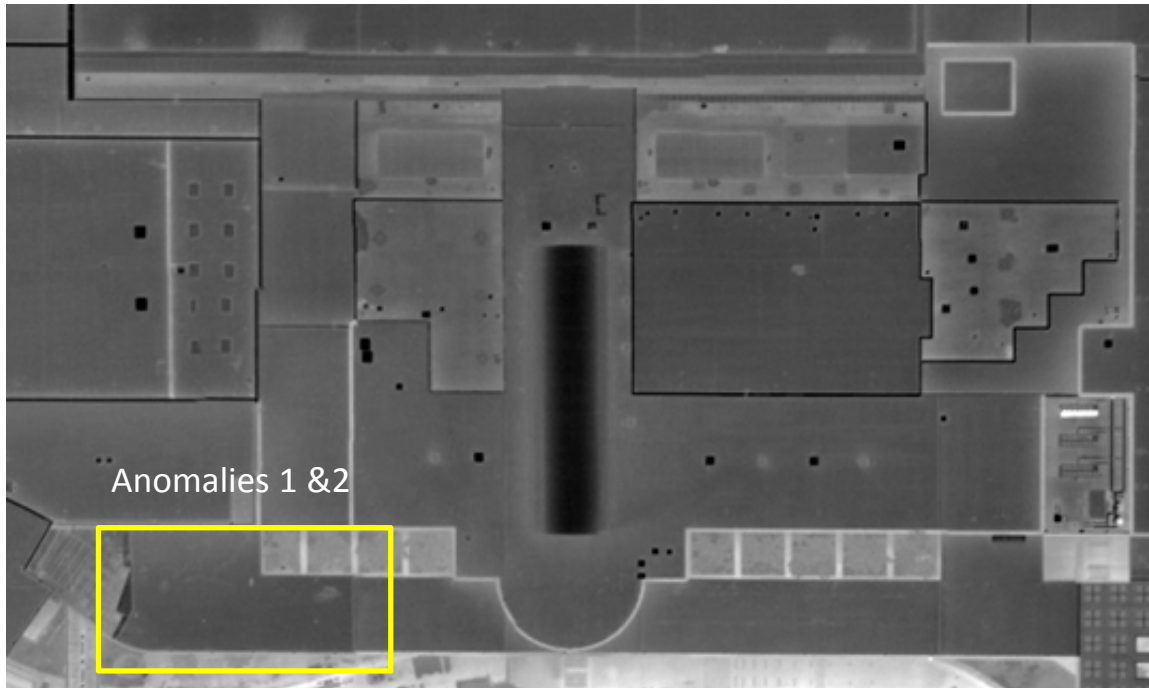
Yellow Box =
Location of
Thermal
Anomaly

Appendix IV

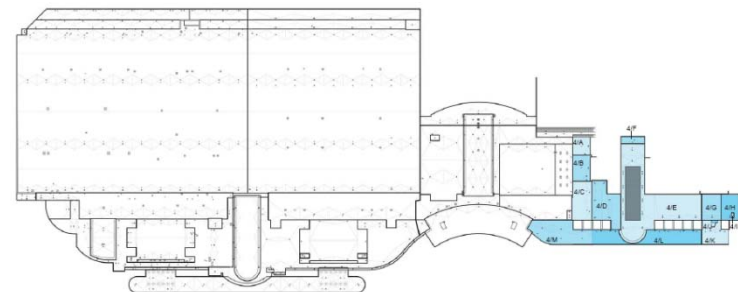
Phase IV Roof Thermograms

Brady Infrared Inspections, Inc.

Phase-IV Roof Anomaly Map



OCCC West Building Roof Repairs
Phase Identification Plan



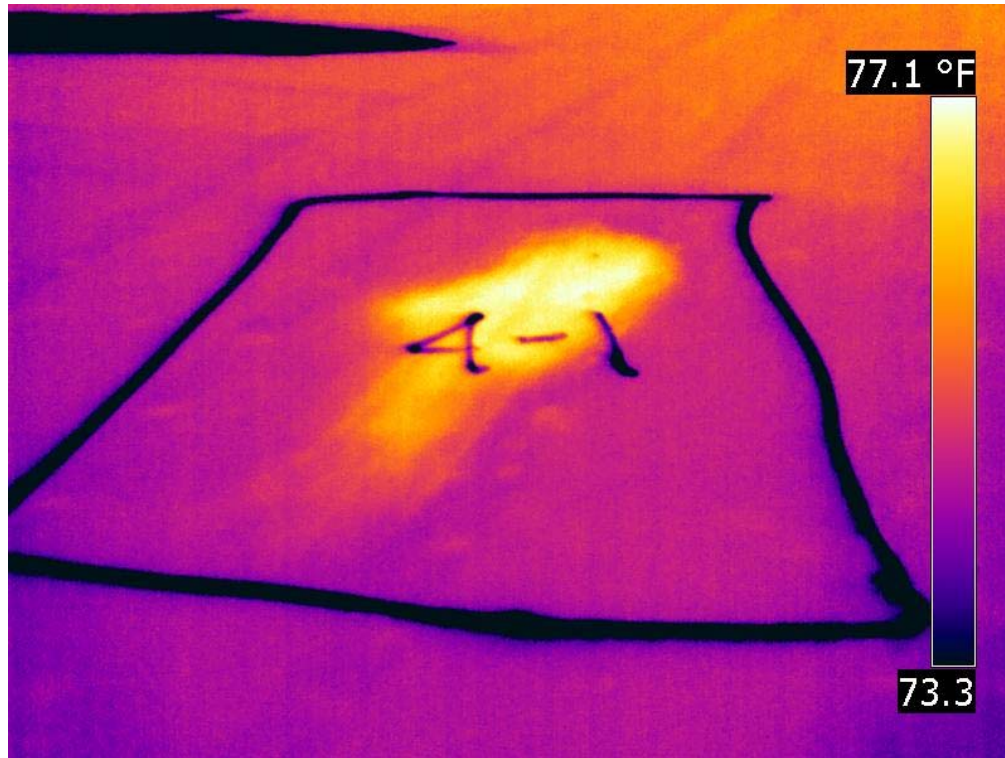


THERMOGRAM IMAGE – 4-1

Orange County Convention Center – Phase 4

Area 1 = 40 sq. ft.

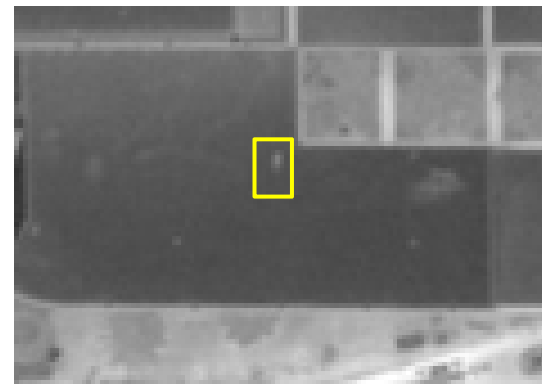
Date: 10/13/2016
Time: 11:37:36 PM
IR Image: IR_0387.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 4-2
Orange County Convention Center – Phase 4
Area 2 = 180 sq. ft.

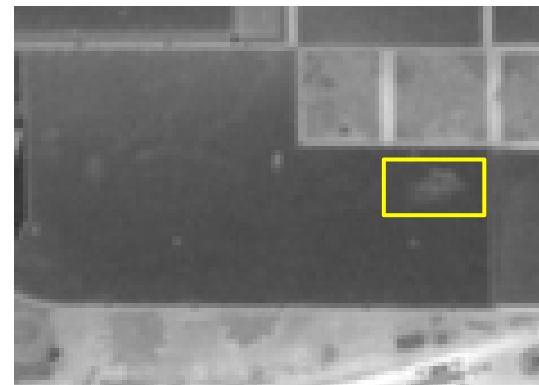
Date: 10/13/2016
Time: 11:37:36 PM
IR Image: IR_0388.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



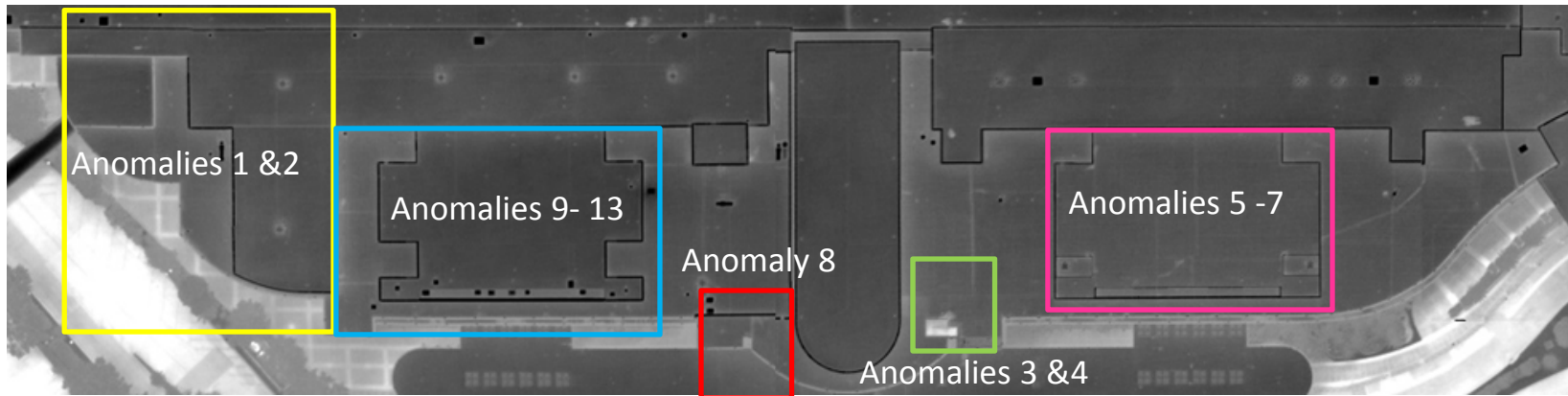
Yellow Box =
Location of Thermal
Anomaly

Appendix V

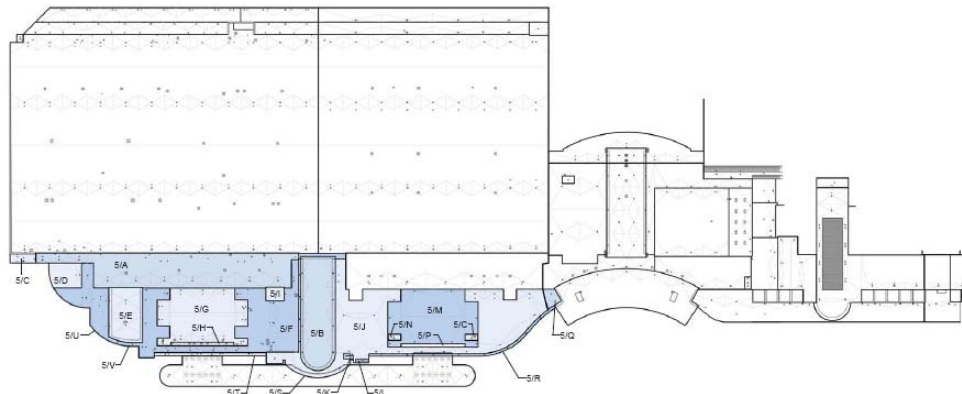
Phase V Roof Thermograms

Brady Infrared Inspections, Inc.

Phase-V Roof Anomaly Map



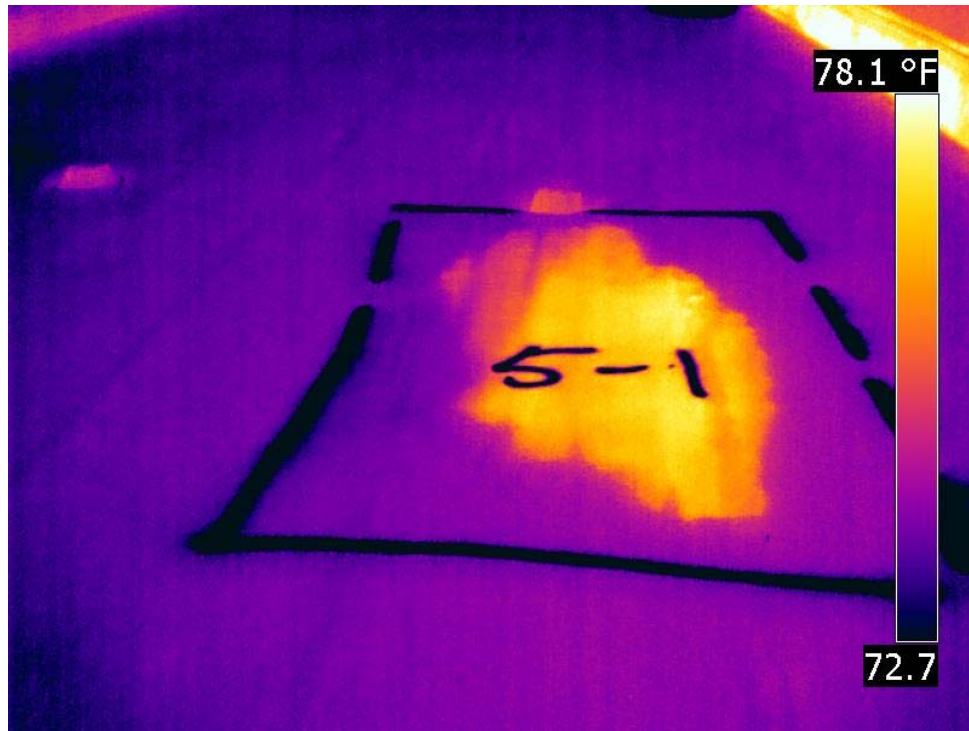
OCCC West Building Roof Repairs
Phase Identification Plan





THERMOGRAM IMAGE – 5-1
Orange County Convention Center – Phase 5
Area 1 = 60 sq. ft.

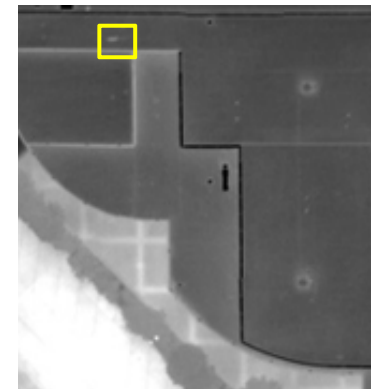
Date: 10/13/2016
Time: 8:59:30 PM
IR Image: IR_0363.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

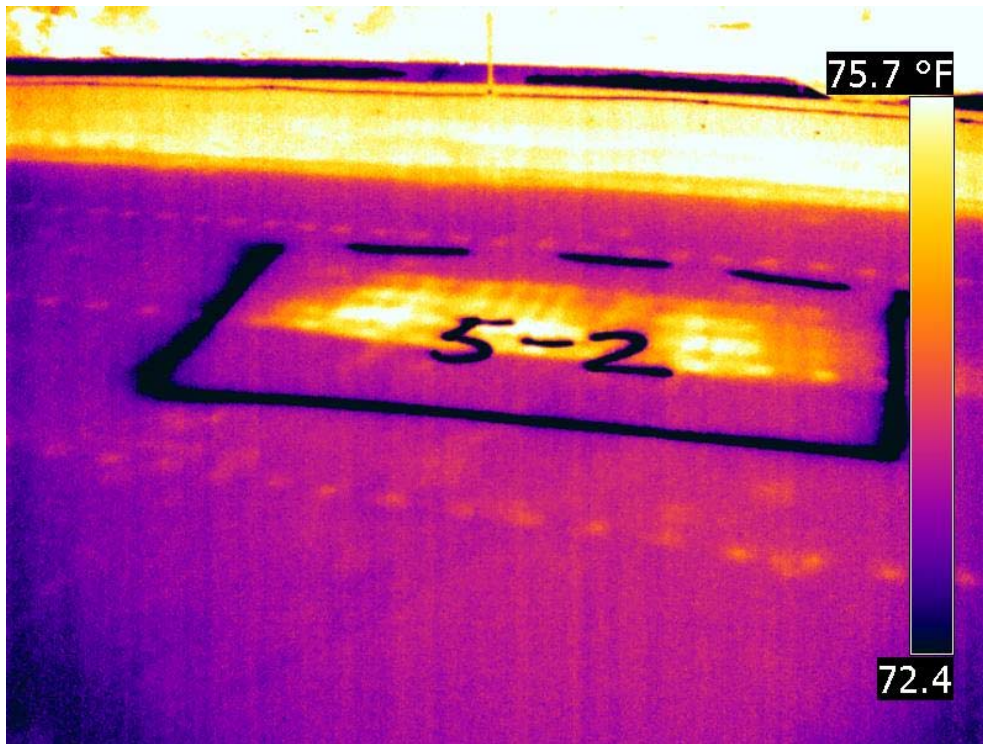


THERMOGRAM IMAGE – 5-2

Orange County Convention Center – Phase 5

Area 2 = 35 sq. ft.

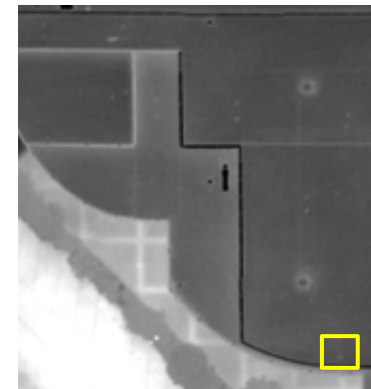
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Infrared Image – light area shows location of trapped moisture



Visual Image

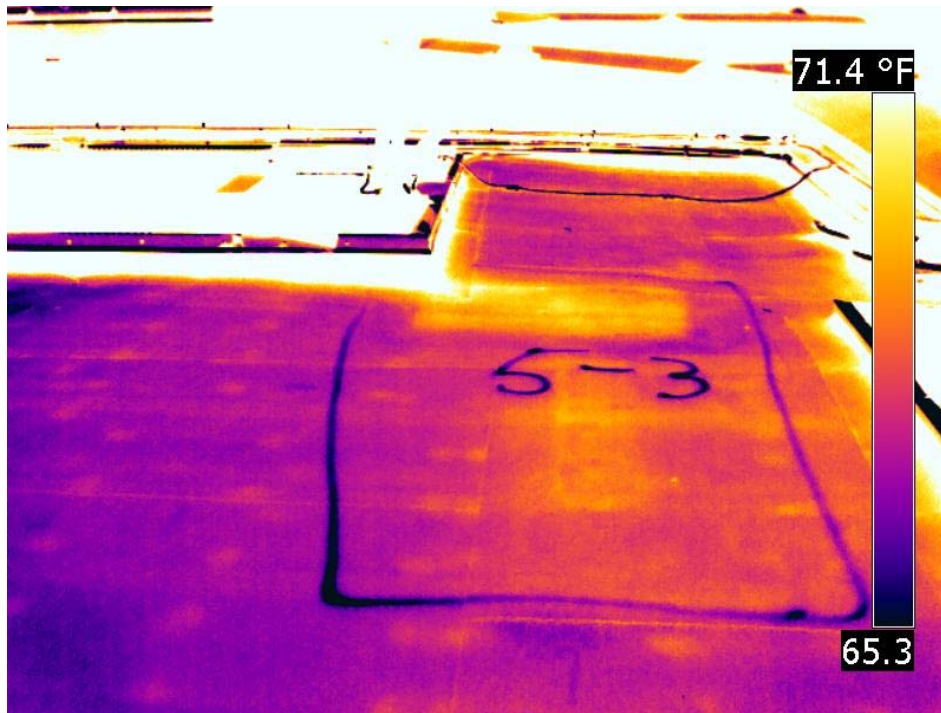


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 5-3
Orange County Convention Center – Phase 5
Area 3 = 32 sq. ft.

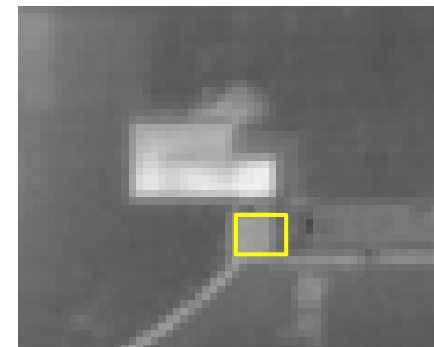
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IR Image: IR_0407.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 5-4

Orange County Convention Center – Phase 5

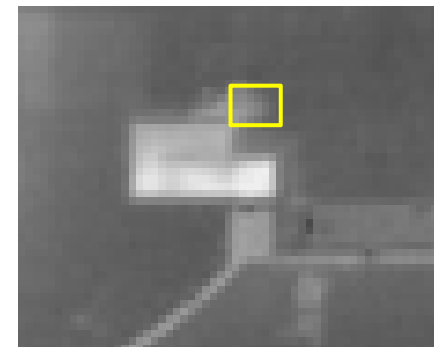
Area 4 = 105 sq. ft.

Date: 10/17/2016
Time: 9:22:26 PM
IR Image: IR_0406.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture



Yellow Box =
Location of Thermal
Anomaly

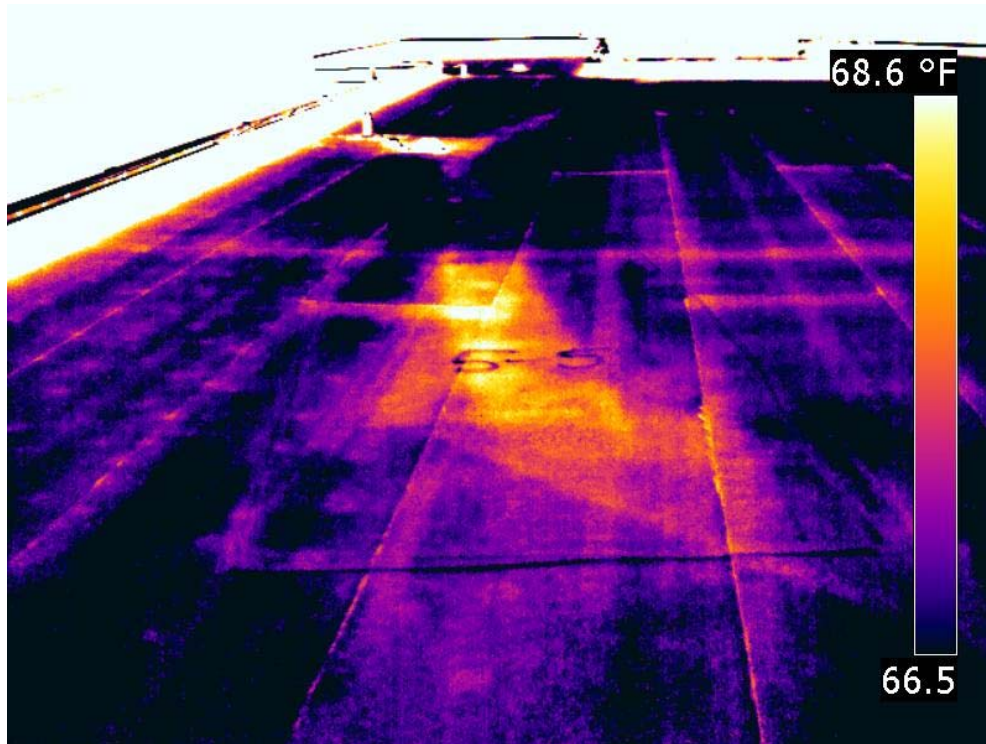


THERMOGRAM IMAGE – 5-5

Orange County Convention Center – Phase 5

Area 5 = 60 sq. ft.

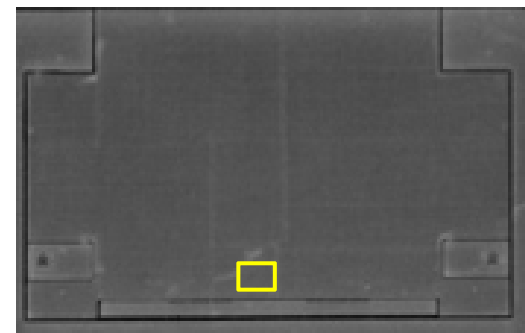
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IR Image: IR_0403.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box = Location of Thermal Anomaly

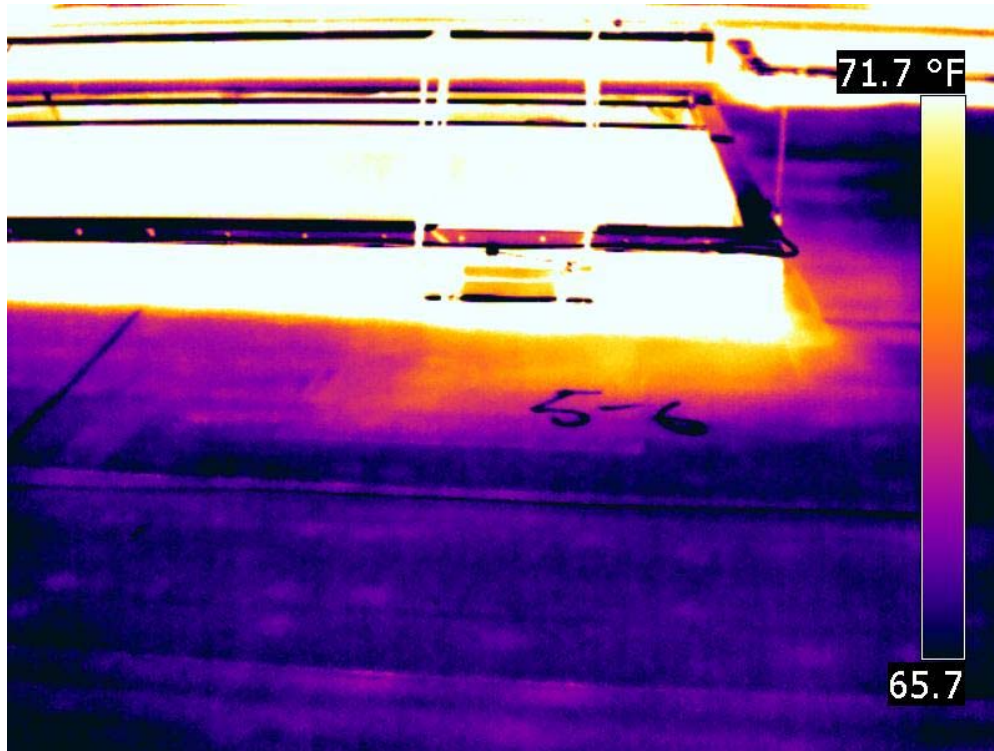


THERMOGRAM IMAGE – 5-6

Orange County Convention Center – Phase 5

Area 6 = 40 sq. ft.

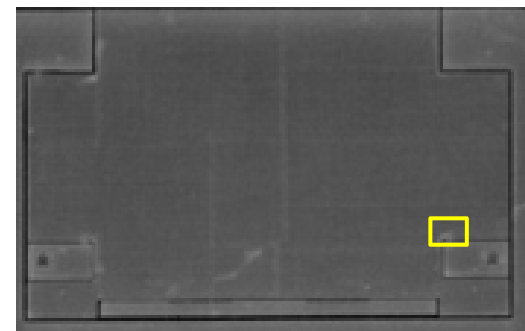
Date: 10/17/2016
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IR Image: IR_0405.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

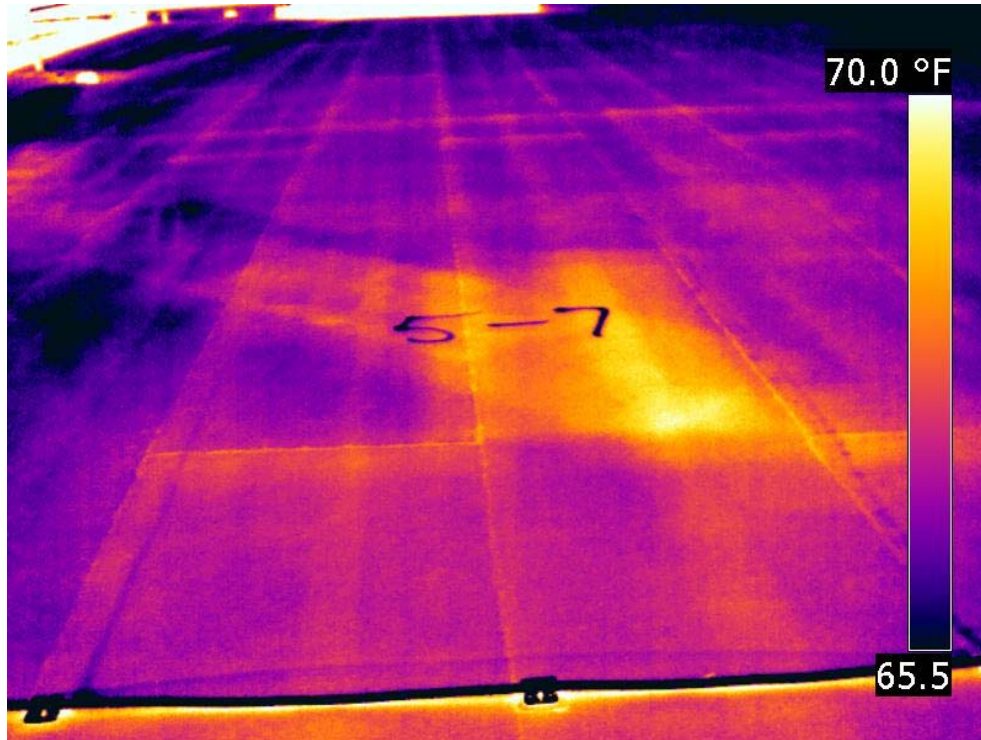


Yellow Box = Location of Thermal Anomaly



THERMOGRAM IMAGE – 5-7
Orange County Convention Center – Phase 5
Area 7 = 60 sq. ft.

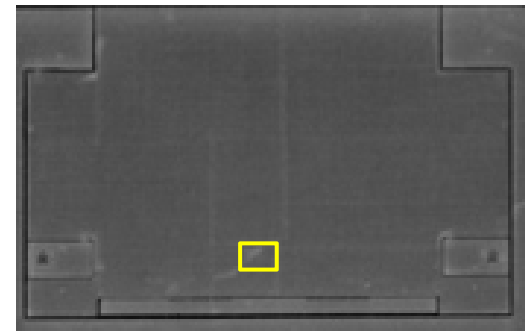
Date: 10/17/2016
Time: 9:12:15 PM
IR Image: IR_0404.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box = Location of Thermal Anomaly

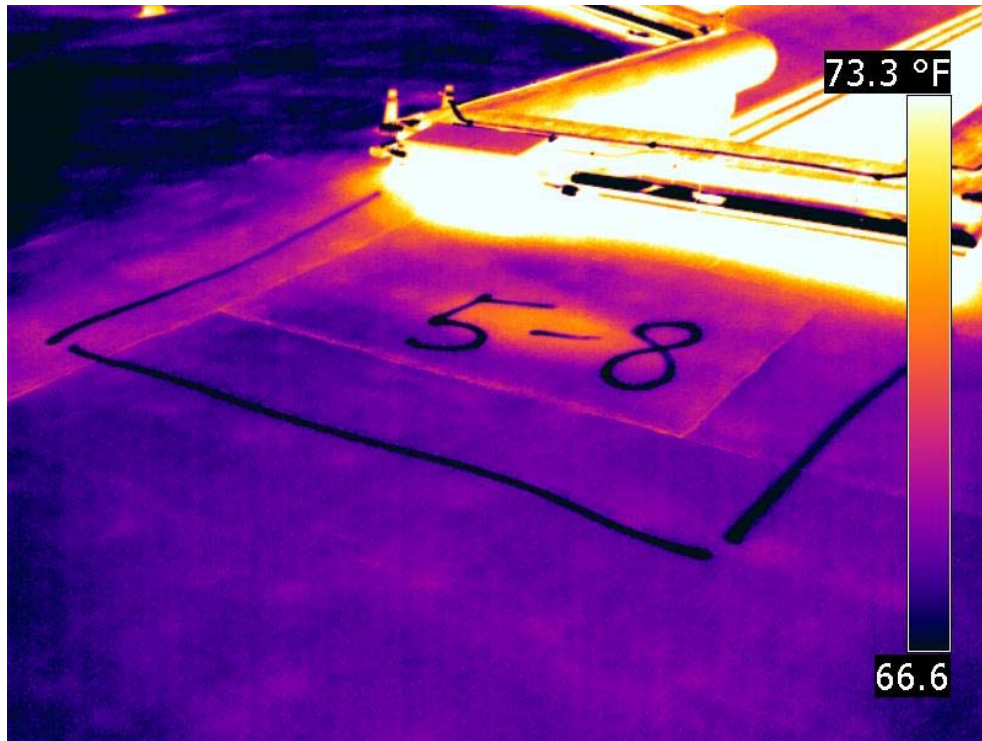


THERMOGRAM IMAGE – 5-8

Orange County Convention Center – Phase 5

Area 8 = 25 sq. ft.

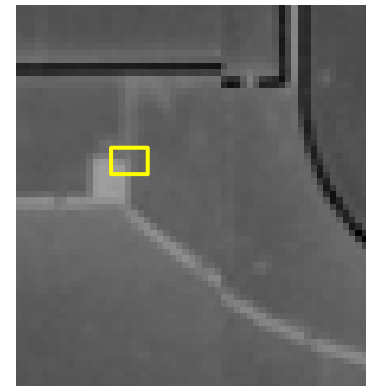
Date: 10/17/2016
Time: 9:30:54 PM
IR Image: IR_0408.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box = Location of Thermal Anomaly



THERMOGRAM IMAGE – 5-9
Orange County Convention Center – Phase 5
Area 9 = 20 sq. ft.

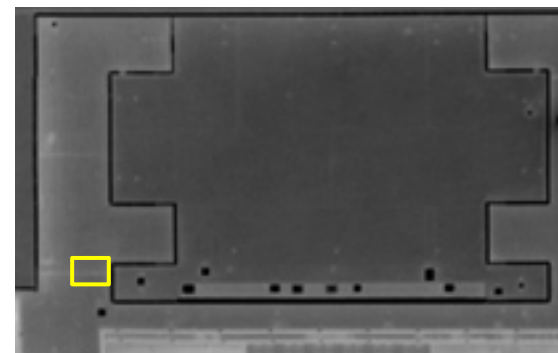
Date: 10/17/2016
Time: 9:38:03 PM
IR Image: IR_0409.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box = Location of Thermal Anomaly



THERMOGRAM IMAGE – 5-10

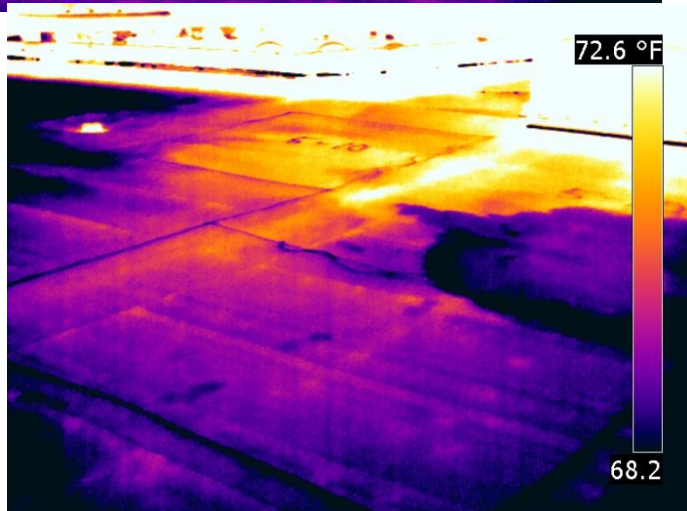
Orange County Convention Center – Phase 5

Area 10 = 264 sq. ft. (an additional 100 to 200 square feet of roof may be present in this areas)

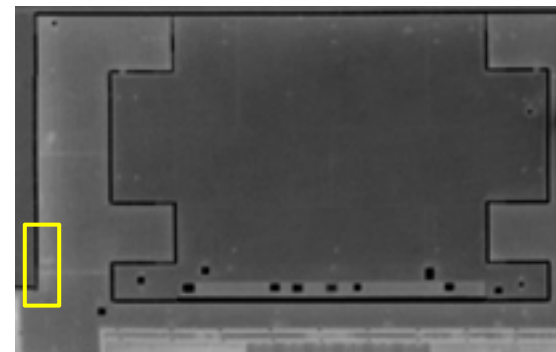
Date: 10/17/2016
Time: 9:42:17 PM
IR Image: IR_0410.jpg
IR_0411.jpg



Visual Image



Infrared Image – light area shows location of trapped moisture – please note that the roof overhang trapped thermal energy and retarded the cooling of the roof in this area as opposed to areas outside of the overhang that cooled at a much faster rate. As a result, the thermal anomaly is not well represent in its entirety and may be larger than actually shown.



Yellow Box = Location of Thermal Anomaly



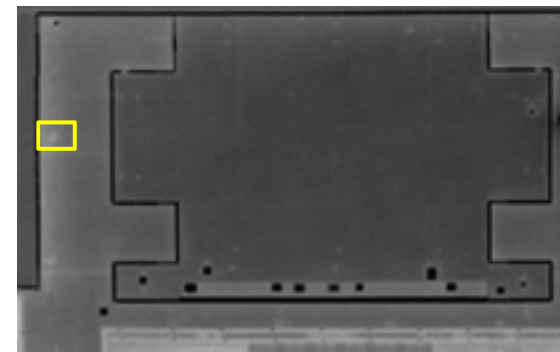
THERMOGRAM IMAGE – 5-11
Orange County Convention Center – Phase 5
Area 11 = 180 sq. ft.

Date: 10/17/2016
Time: 9:52:29 PM
IR Image: IR_0412.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture – please note that the roof overhang trapped thermal energy and retarded the cooling of the roof in this area as opposed to areas outside of the overhang that cooled at a much faster rate. As a result, the thermal anomaly is not well represent in its entirety and may be larger than actually shown.

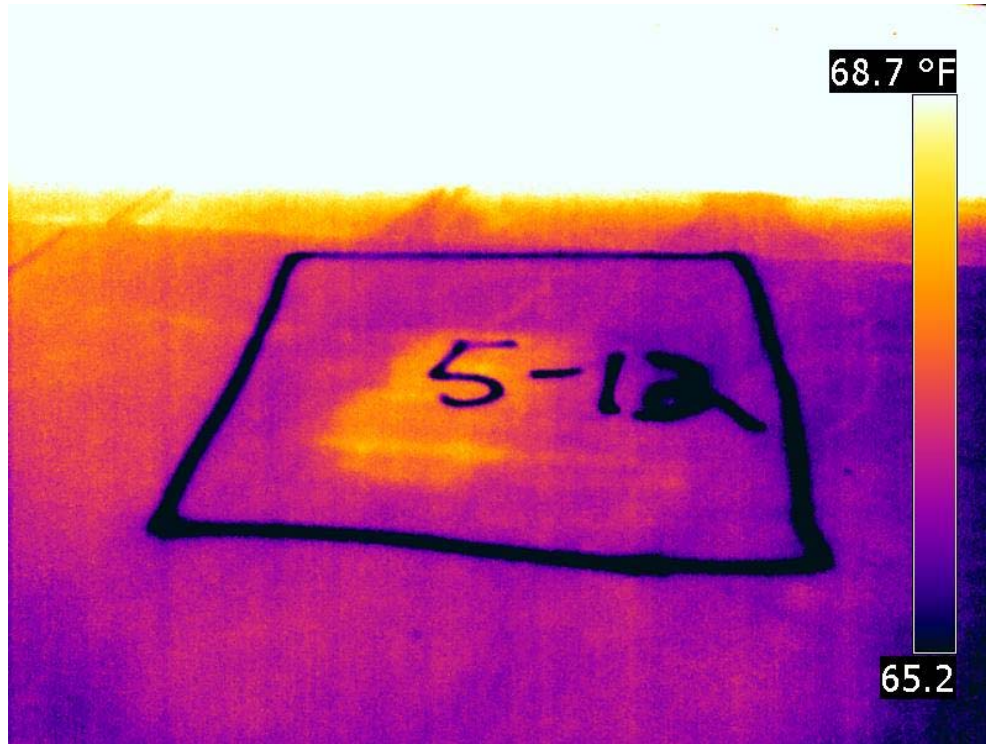


Yellow Box = Location of Thermal Anomaly



THERMOGRAM IMAGE – 5-12
Orange County Convention Center – Phase 5
Area 12 = 25 sq. ft.

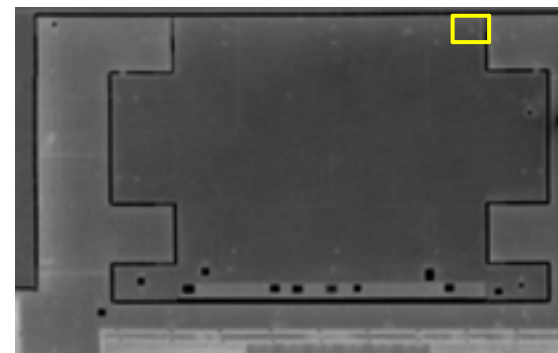
Date: 10/17/2016
Time: 9:59:44 PM
IR Image: IR_0414.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box = Location of Thermal Anomaly



THERMOGRAM IMAGE – 5-13
Orange County Convention Center – Phase 5
Area 13 = 60 sq. ft.

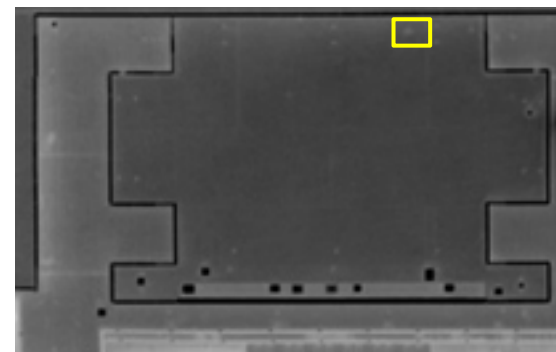
Date: 10/17/2016
Time: 10:01:23 PM
IR Image: IR_0415.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



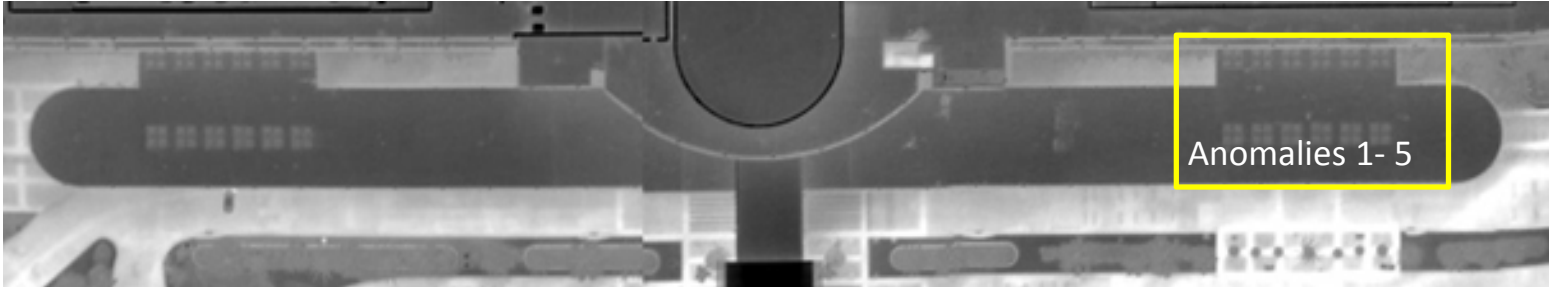
Yellow Box = Location of Thermal Anomaly

Appendix VI

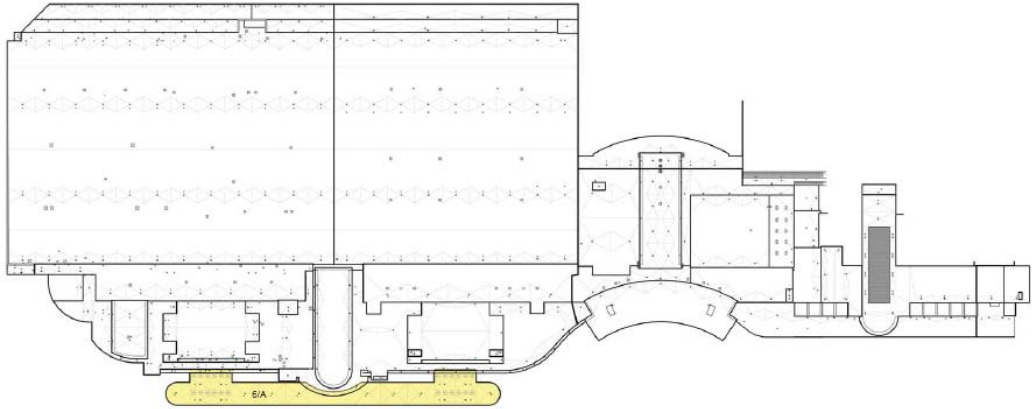
Phase VI Roof Thermograms

Brady Infrared Inspections, Inc.

Phase-VI Roof Anomaly Map



OCCC West Building Roof Repairs
Phase Identification Plan with Roof Areas



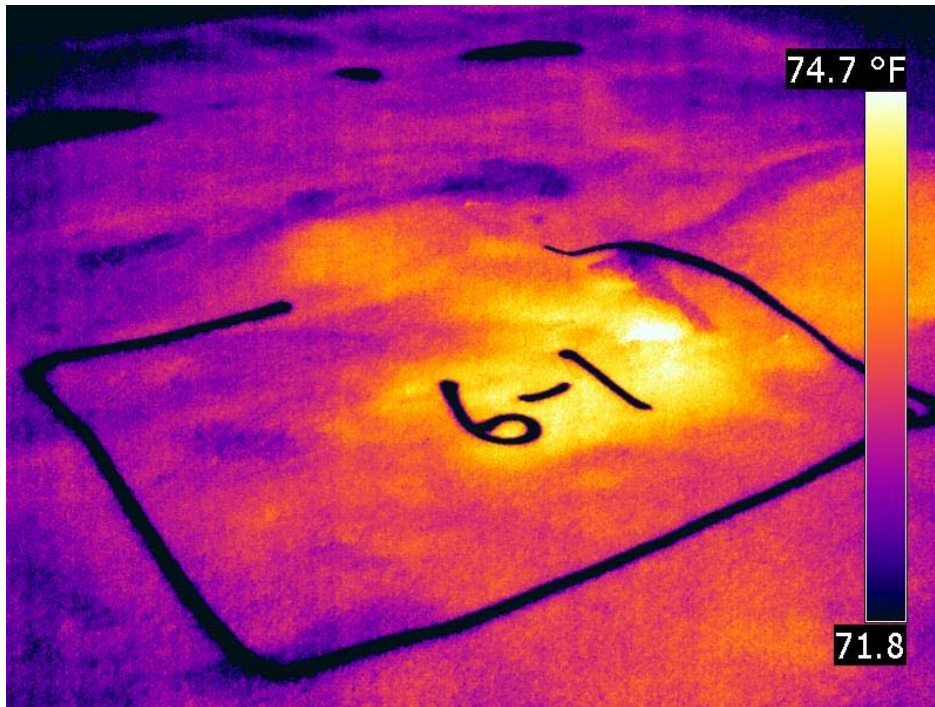


THERMOGRAM IMAGE – 6-1

Orange County Convention Center – Phase 6

Area 1 = 20 sq. ft.

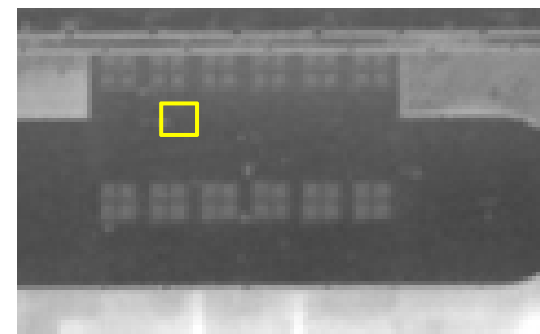
Date: 10/13/2016
Time: 11:11:56 PM
IR Image: IR_0382.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

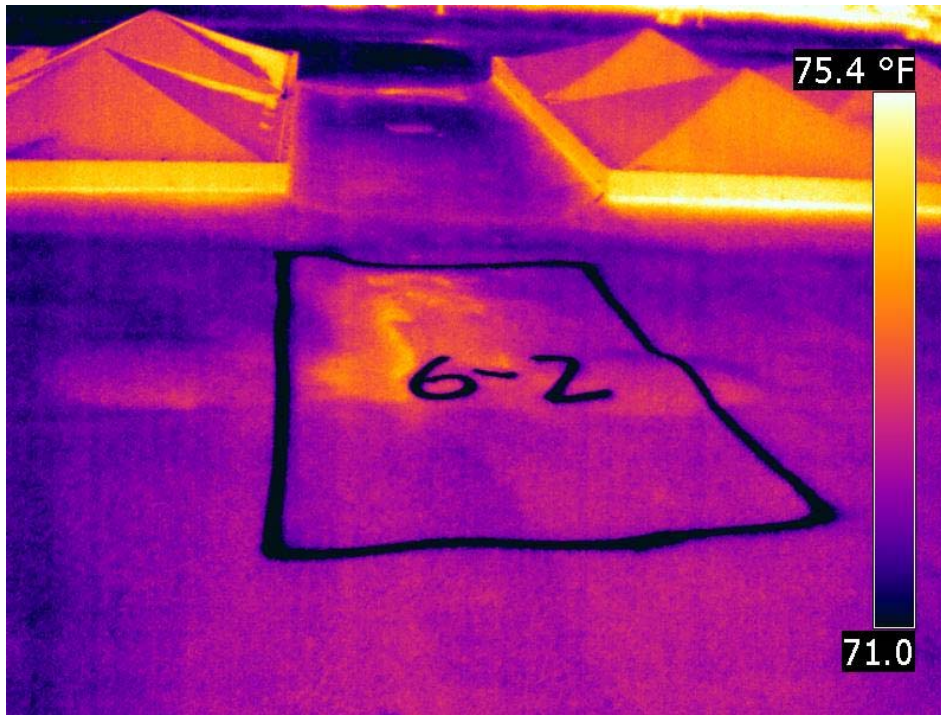


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 6-2
Orange County Convention Center – Phase 6
Area 2 = 20 sq. ft.

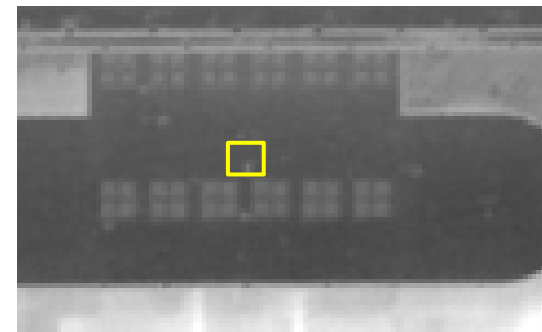
Date: 10/13/2016
Time: 11:10:14 PM
IR Image: IR_0383.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly



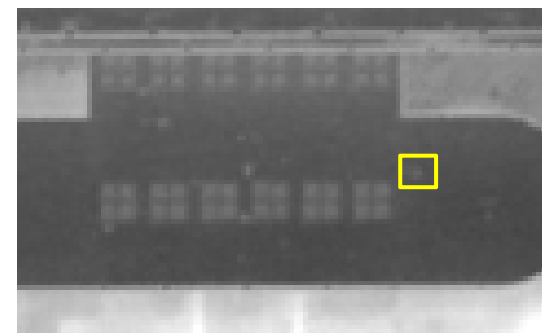
THERMOGRAM IMAGE – 6-3
Orange County Convention Center – Phase 6
Area 3 = 18 sq. ft.

Date: 10/13/2016
Time: 11:13:55 PM
IR Image: IR_0384.jpg



Visual Image

Infrared Image – light area shows location of trapped moisture



Yellow Box =
Location of Thermal
Anomaly

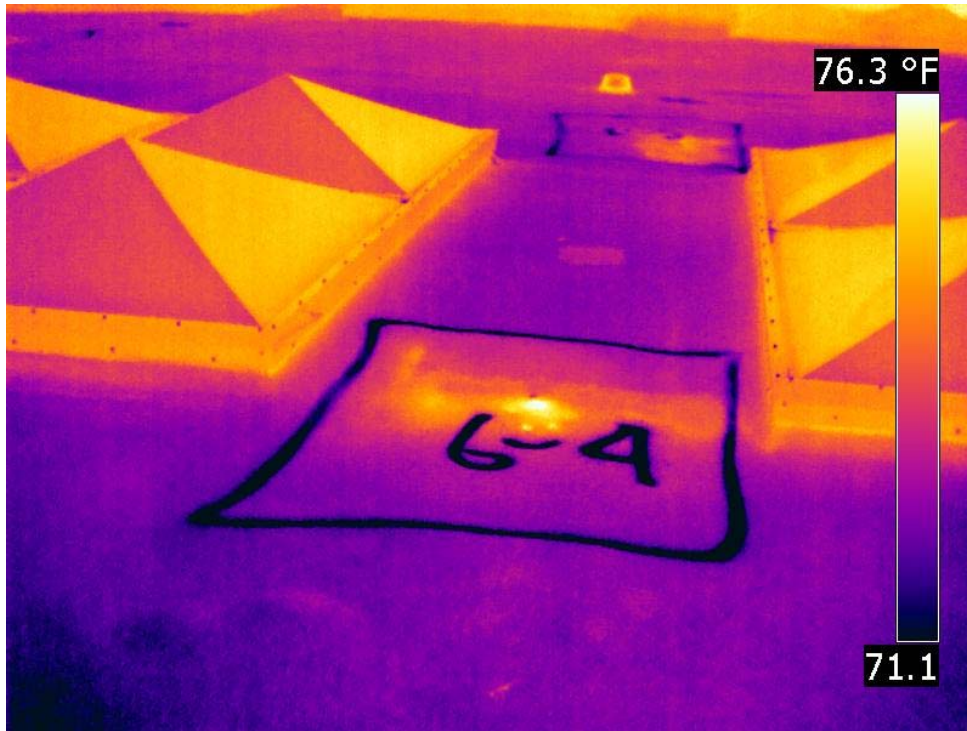


THERMOGRAM IMAGE – 6-4

Orange County Convention Center – Phase 6

Area 4 = 9 sq. ft.

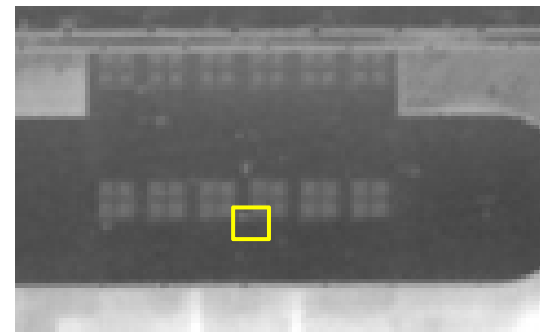
Date: 10/13/2016
Time: 11:15:33 PM
IR Image: IR_0385.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image

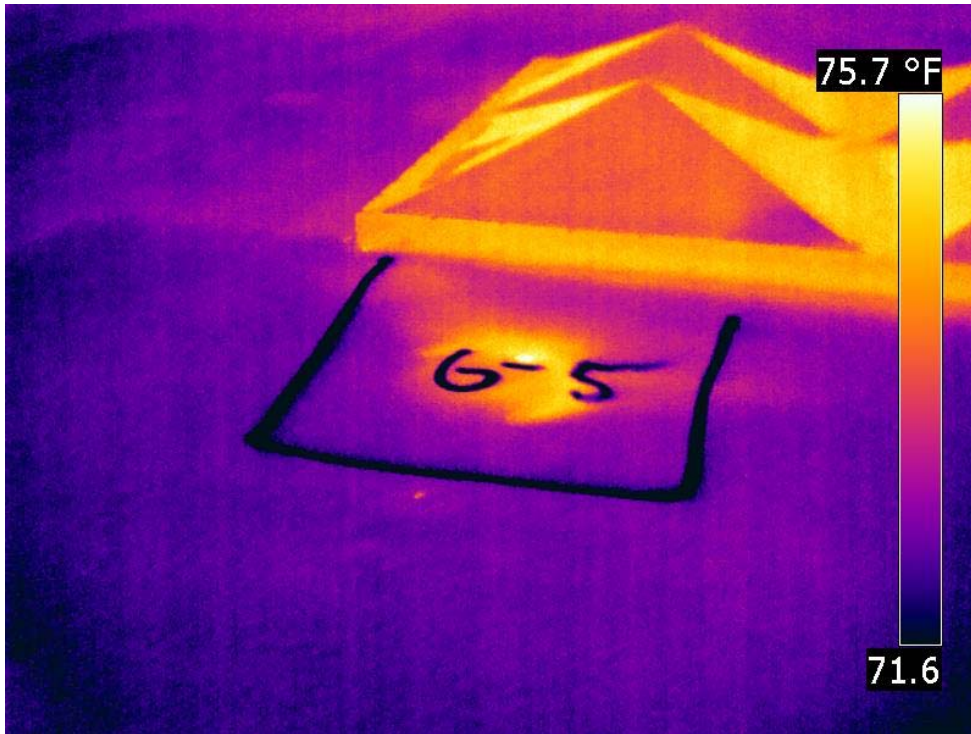


Yellow Box =
Location of Thermal
Anomaly



THERMOGRAM IMAGE – 6-5
Orange County Convention Center – Phase 6
Area 5 = 9 sq. ft.

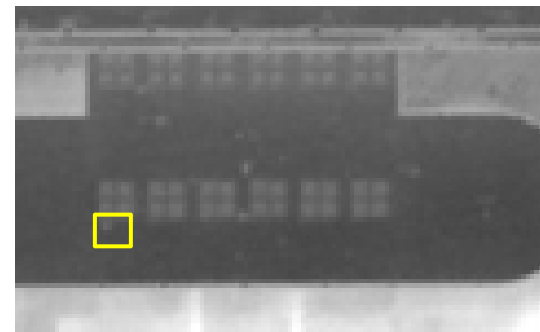
Date: 10/13/2016
Time: 11:16:44 PM
IR Image: IR_0386.jpg



Infrared Image – light area shows location of trapped moisture



Visual Image



Yellow Box =
Location of Thermal
Anomaly

**SELECTIVE DEMOLITION
SECTION 02070**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Demolition of roof replacement areas and removal of material from the site as described in the summary of work.

1.2 RELATED SECTIONS

- A. Division 1 – General Requirements

1.3 QUALIFICATIONS

- A. Demolition Firm: Company specializing in performing the Work of this Section with a minimum of five (5) years experience.

1.4 REGULATORY REQUIREMENTS

- A. Conform to applicable code for demolition of roofing, safety of adjacent structures, dust control and disposal.
- B. Notify affected utility companies before starting work and comply with their requirements.
- C. Do not close or obstruct roadways, sidewalks, and hydrants without permits.
- D. Conform to applicable regulatory procedures when hazardous or contaminated materials are present.

1.5 SCHEDULING

- A. Schedule work under the provisions of Division 1
- B. Schedule work to coincide with new reroofing work.
- C. Describe demolition removal procedures and schedule

1.6 PROJECT CONDITIONS

- A. Existing Conditions:
 - 1. Report conflicts or problems to the Purchasing and Contracts Division for resolution prior to Bidding. Failure to report these conflicts and problems places the responsibility on the Contractor to complete the work in accordance with the Documents at no additional cost to the Owner.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 PREPARATION

- A. Provide, erect, and maintain temporary barriers and security devices.
- B. Protect existing landscaping materials, appurtenances, structures and adjacent roofs which are not scheduled to be demolished.

3.2 DEMOLITION REUIREMENTS

- A. Conduct demolition to minimize interference with adjacent structures and occupants.
- B. Cease operations immediately if adjacent structures appear to be in danger. Notify the Purchasing and Contracts Division. Do not resume operations until directed.
- C. Conduct operations with minimum interference to public or private accesses. Maintain egress and access at all times.

3.3 DEMOLITION

- A. Remove demolished materials from site.
- B. Do not burn or bury materials on site. Leave site in clean condition.
- C. Remove temporary work.
- D. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of Division 1.
- E. Any materials damaged by the demolition process that are out of the scope of work, as specified by the contract documents, must be replaced at no additional cost to the owner. Any areas that are suspected to be damaged during demolition should be reported to the Purchasing and Contracts Division for resolution prior to bidding.

END OF SECTION

MISCELLANEOUS ROUGH CARPENTRY SECTION 06100

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
1. Miscellaneous framing and sheathing;
 2. Nailers and blocking,
 3. Field fabricated expansion joint curbs and curb extensions,
 4. Preservative treatment of wood where indicated.
- B. Related Sections:
1. Section 07532 – Thermoplastic Single Ply Roofing
 2. Section 07620 – Sheet Metal Flashing and Trim

1.2 REFERENCES

- A. American National Standards Institute:
1. ANSI A208.1 - Mat-Formed Wood Particleboard.
- B. American Wood-Preservers' Association:
1. AWPA Standard U1, UC 1-4 - All Timber Products - Preservative Treatment by Pressure Process.
 2. AWPA Standard U1, UCF A and B - Structural Lumber - Fire-Retardant Treatment by Pressure Processes.
- C. ASTM International:
1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. National Fire Protection Association:
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- E. Southern Pine Inspection Bureau:
1. SPIB - Standard Grading Rules for Southern Pine Lumber.
- F. Underwriters Laboratories Inc.:
1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
- G. U. S Department of Commerce National Institute of Standards and Technology:
1. DOC PS 1 - Construction and Industrial Plywood.
 2. DOC PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
 3. DOC PS 20 - American Softwood Lumber Standard.

**MISCELLANEOUS ROUGH CARPENTRY
SECTION 06100**

1.3 SUBMITTALS

- A. Division 1 - Submittal Procedures
- B. Product Data: Submit technical data on
 - 1. Wood /Plywood
 - 2. Fasteners and Anchors
 - 3. Wood preservative and fire retardant treatment materials and application instructions.
 - 4. MSDS of treatment materials.
- C. Samples:
 - 1. Fastener types : Two (2) of each type
 - 2. Material Samples, if requested by the Architect.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. Lumber Grading Agency: Certified by DOC PS 20.
 - 2. Lumber: DOC PS 20.
- B. Surface Burning Characteristics:
 - 1. Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- C. Apply label from agency approved by authority having jurisdiction to identify each preservative treated and fire retardant treated material.
- D. Perform Work in accordance with current Florida Building Code requirements.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Lumber Grading Rules: SPIB.
- B. Miscellaneous Framing/Blocking: Stress Group D 1x and 2x No. 2 Grade Southern Yellow Pine species, 19 percent maximum moisture content, pressure preservative treated where indicated.
- C. Plywood Sheathing/Decking: APA/EWA Structural I, 5/8" thickness (unless otherwise noted), Grade: CDX; pressure treated with preservative and fire retardant treated. Exposure Durability: Exposure 1.

MISCELLANEOUS ROUGH CARPENTRY SECTION 06100

2.2 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. All fasteners: Stainless steel for high humidity and treated wood locations, hot dipped galvanized steel elsewhere.
 - 2. Nails: ASTM F1667; ring-shanked, except as otherwise directed.
 - 3. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.

2.3 FACTORY WOOD TREATMENT

- A. Wood Preservative (Pressure Treatment) for wood (exterior, above ground): AWPA U1, use category 3 (UC3) using water borne preservative with 0.25 pounds per cubic foot of wood product.
- B. Wood preservatives shall not contain arsenic or arsenate.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 1 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify substrate conditions are ready to receive blocking, curbing and framing.

3.2 PREPARATION

- A. Coordinate placement of blocking, curbing and framing items.

3.3 INSTALLATION

- A. General:
 - 1. Discard material with defects which might impair quality of work and units which are too small to fabricate work with minimum joints or optimum joint arrangement.
 - 2. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.
 - 3. Securely attach carpentry work to substrate by anchoring and fastening as shown or as required by recognized standards. Countersink fastener heads on exposed carpentry work.
 - 4. Use fasteners and anchorages as indicated. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required. Holes drilled oversized or wallered out, shall be re-drilled.
 - 5. Place horizontal members, crown side up.

**MISCELLANEOUS ROUGH CARPENTRY
SECTION 06100**

6. Construct curb members of solid wood sections.
 7. Do not install wood nailers or sheathing more than one day in advance from installation of roofing. Install dry-in felt over any wood nailers and sheathing.
- B. Nailers, Blocking and Curb Extensions:
1. Coordinate curb extensions and installation of wood nailers with roof construction work.
 2. Provide blocking and edging wherever shown and where required for screeding or attachment of other work.
 3. Set members level and plumb, in correct position.
 4. Construct curb members of single pieces.
 5. Curb roof openings [except where prefabricated curbs are provided]. Form corners by alternating lapping side members.
 6. Attach to substrates as required to support applied loading. Countersink bolts and nuts with washers flush with surfaces, unless otherwise shown.
 7. Where new members are doubled, ends shall be lapped and thoroughly spiked to each other and to bearing members.
 8. Where new members bear on concrete, securely fasten to same by bolts or lag screws on centers as called for on drawings, staggered. Provide heads of all bolts or lag screws with large-head washers.
 9. Round edges and corners of wood plates where flashing occurs.
- C. Plywood Sheathing (wall sheathing replacement) (see Details):
1. Install sheathing properly framed to required lines, level and rigidly secured in place.
 2. Cut sheathing sections to fit. Leave 1/8" clearance between panels at side laps. Cover sheathing with dry-in felt and seal top horizontal edge.

3.4 SCHEDULES

- A. Roof Perimeter Nailers, Curbs and Curb Extensions: See project manual details and plans for sizes and locations.
- B. Plywood Sheathing (as applicable): See project manual details and plans for locations.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removal of existing roof system in preparation for the installation of a new single-ply membrane fastened to the metal deck.

- B. Related Sections
 - 1. Section 02070 – Selective Demolition
 - 2. Section 06100 – Rough Carpentry
 - 3. Section 07532 – Thermoplastic Single Ply Roofing

1.2 DESCRIPTION OF WORK

- A. All Areas where indicated: Remove existing roof membrane system, perimeter flashings, base flashing, counter flashings, edge metal, counterflashing, vent stack flashing down to the existing materials to remain as described in Section 01010 – Summary of Work and the Roof Characteristics Schedule on Sheet G01.

- B. Remove and replace any damaged or deteriorated blocking, nailers or sheathing.

1.3 QUALIFICATIONS

Materials Removal Firm: Company specializing in performing the work of this Section with minimum 3 years documented experience.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.

- B. Product Data: Provide product description and specification information of roof materials and accessories as may be specified elsewhere.

1.5 PRE-INSTALLATION CONFERENCE

- A. Attend conference specified in Division 1.

1.6 PROJECT CONDITIONS

- A. Existing Conditions
 - 1. The roof applicator shall verify existing conditions, such as soundness of perimeter conditions, varying deck and other visible conditions prior to bidding.
 - 2. Report conflicts and problems to the Purchasing and Contracts Division for resolution prior to bidding. Failure to report these conflicts and problems places

**PREPARATION FOR RE-ROOFING
SECTION 07015**

the responsibility on the Prime Contractor to complete the work in accordance with the Documents at no additional cost to the Owner.

3. Replace or restore to original condition any materials or work damaged during construction.
4. Surfaces not designated to receive the system shall be properly masked or otherwise protected against accidental spillage or application of the material to those areas.
5. Failure to install the work in strict accordance with provisions of this Section, is subject to total rejection of work specified herein.

1.7 ENVIRONMENTAL REQUIERMENTS

- A. Do not remove existing roofing membrane when weather conditions threaten the integrity of the building contents or intended continued occupancy.
- B. Maintain continuous protection prior to and during installation of new roofing system.

1.8 SCHEDULING AND COORDINATION

- A. Schedule and coordinate work under the provisions of Division 1.
- B. Schedule work to coincide with commencement of installation of new roofing system.
- C. Coordinate the work with other affected mechanical and electrical work associated with roof penetrations.
- D. Remove only existing roofing materials that can be replaced with new materials the same day or as the weather will permit.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Temporary Protection: Sheet polyethylene; provide weights to retain sheeting in position.
- B. Protection Board (as may be required): ASTM C208, Roof Insulating Board type, cellulose fiber board, with the following characteristics:
 1. Board Size 48x96 inches.
 2. Board Thickness 1/2 inch
 3. Board Edges square

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing site conditions under provisions of Division 1.
- B. Verify that existing roof surface is clear and ready for work of this section.

3.2 PREPARATION

- A. Sweep roof surface clean of loose matter. Remove loose refuse and dispose off site.

3.3 MATERIAL REMOVAL

- A. Remove metal counter flashings
- B. Remove roofing membrane, perimeter base flashings, flashings around roof protrusions, pitch pans and pockets
- C. Remove damaged insulation and fasteners, cant strips and blocking.

3.4 TEMPORARY PROTECTION

- A. Protect finished Work under provisions of Division 1.
- B. Provide temporary protective sheeting over uncovered deck surfaces.
- C. Turn sheeting up and over parapets and curbing. Retain sheeting in position with temporary fasteners.
- D. Provide for surface drainage from sheeting to existing drainage facilities.
- E. Do not permit traffic over unprotected or repaired deck surfaces.

3.5 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 1.
- B. Inspection will identify the exact limits of material removal.
- C. Testing will identify the exact condition of existing materials and their reuse, repair or removal.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preformed, pre-finished flush metal panel wall system.
 - 2. Flashings, trim, anchorage, and accessories.

- B. Related Sections:
 - 1. Section 01010 – Summary of Work
 - 2. Section 06100 – Miscellaneous Rough Carpentry
 - 3. Section 07620 – Sheet Metal Flashing and Trim
 - 4. Section 07900 – Joint sealers

1.2 REFERENCES

- A. American Society of Civil Engineers (ASCE)
 - 1. ASCE 7-10 - Minimum Design Loads for Buildings and Other Structures.

- B. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA - 620 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Aluminum Substrates.
 - 2. AAMA - 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
 - 3. AAMA - 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels.

- C. ASTM International (ASTM):
 - 1. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A792 - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - 3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 4. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
 - 5. ASTM D226 - Standard Specification for Asphalt Saturated Organic Felt Used in Roofing and Waterproofing.
 - 6. ASTM D412 - Standard Test Method for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
 - 7. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

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8. ASTM D6757 - Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing.
9. ASTM E283 - Standard Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.
10. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Doors, and Curtain Walls by Uniform Static Air Pressure Differential.
11. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
12. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.3 SYSTEM DESCRIPTION

- A. Metal roof and wall panel systems:
 1. Flush metal wall panels – Metal panels are to be install as indicated in the details provided to complete new flashing conditions.
- B. Design Requirements; design roof system to withstand:
 1. Live and dead loads in accordance with Florida Building Code, Fifth Edition (2014).
 2. Minimum wind pressures in accordance with current editions of ASCE 7-10 and the Florida Building Code, Fifth Edition (2014) with maximum allowable deflection of L/180, tested in accordance with ASTM E1592.
 3. Movement caused by an ambient temperature range of 120 degrees F and a surface temperature range of 180 degrees F.
- C. Performance Requirements:
 1. Air leakage: Maximum 0.03 CFM per square foot of roof area, measured at reference differential pressure across assembly of 6.24 PSF, tested to ASTM E 283.
 2. Water leakage: None. Tested to ASTM E 331 with test pressure of 6.24 PSF.

1.4 SUBMITTALS

- A. Submittals for Review:
 1. Submit under provisions of Division 1.
 2. Shop Drawings: Show scaled layouts of panel configuration. Indicate only those conditions which differ from or are not included in the project documents.
 3. Product Data:
 - a. Show system components (panels, trim, and accessories).
 - b. Provide data on metal type, finishes, characteristics and general recommendations from metal panel manufacturer.
 - c. Current Florida Product Approval or Miami-Dade Notice of Acceptance which meets or exceeds the design requirements of this project for the metal roof panel system only.
 - d. Provide data indicating that submitted panel material is Energy Star compliant and listed by the CRRC, and has a Solar Reflectance of 65%

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or higher tested to ASTM C 1549 and calculated in accordance with ASTM E 1980 acceptable to FPL.

4. Manufacturer's written installation instructions: Indicate special handling criteria, installation sequence, and cleaning procedures and certifications.
 5. Engineer's Calculations:
 - a. Provide calculations which have been prepared, signed and sealed by a Florida Registered Structural Engineer based on the performance and test data obtained from the manufacturer's ASTM E 1592 testing program.
 - b. Submit two copies of the ASTM E 1592 test results with the structural calculations for review by the Owner and the Architect.
 6. Samples:
 - a. After color selection submit two (2) sets of two (2) interlocking roof panel samples and two (2) wall panel systems, approximately 24" to 36" wide by 30" long, in selected color on representative backing.
 - b. Fasteners: Submit two (2) samples of each fastener type.
- B. Closeout Submittals
1. Warranties: Panel system and Finish

1.5 MOCK-UP

- A. Provide mock up of the metal wall systems under provisions of Division 01. Contractor bears responsibility for alerting owner of the mock up for approval.
- B. Construct metal panel mock up, three (3) feet long (or two panel widths), minimum width which includes metal panels mounted to substrate illustrating typical methods and materials for the standing seam support, deck anchorage, hemmed lower edge and cleat, boxed upper edge, metal 'Z' closure piece, sealant application and ridge cap flashing installation
- C. Construct metal wall system mock up in conjunction with the metal panel system to demonstrate attachment of the two systems prior to continuing with work on the rest of the project.
- D. Mock up may remain as part of the Work.

1.6 QUALITY ASSURANCE

- A. Materials Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with five (5) years current documented experience.
- B. Manufacturer's Field Inspection and Services
 1. Manufacturer of roofing products shall provide qualified personnel to observe field conditions of surfaces and installation, quality of workmanship, as applicable, and to make appropriate recommendations.

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2. Representative shall visit the project throughout the progress of the work as necessary to ensure the quality of workmanship. Site visits shall be schedule as follows:
 - a. Pre-construction meeting
 - b. Major construction segments
 - c. Perform Manufacturer's final inspection prior to Architect's Substantial Completion Inspection.
 - d. Attend called meetings.
 3. Representative shall submit written reports within three (3) days to Architect listing observations, recommendations and other related comments
- C. Coordinated Installation: Except as otherwise indicated, perform roofing and flashing work as a single integrated unit of work, without division of responsibility between separate installers (a Single Installer responsibility is required)
- D. Installer Qualifications:
1. Work of this Section shall be performed by a single installer and shall be a firm specializing in metal roofing system work for at least five (5) years documented experience and capable of showing successful installations similar to work required for this project.
 2. If requested by the Owner, submit a copy of a list of projects, (with project name, location, date, size, roof system, cost and references). The list shall contain contacts and phone numbers.
 3. The installation shall be performed by a roofing contractor who has been trained by the manufacturer and certified in writing as an installer approved by the manufacturer of the metal roofing. Certificate holder must be employed by roofing contractor and be present at the jobsite for the duration of the project.
 4. Contractor shall maintain a full-time non-working supervisor/foreman on job site during times that roofing work is in progress. Supervisor must have minimum of three (3) years' experience in roofing work of same or similar products manufacturer as bid.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver to site, store, protect and handle products under provisions of Division 01.
- B. Store and protect panels from moisture due either from precipitation or condensation, damage by construction traffic, temperature extremes, mud, dust sand, oil, grease or dirt.
- C. Protect panels from contact with any materials that could cause staining or discoloration of finish.
- D. Stack preformed and prefinished material in such a manner as to prevent twisting, bending, warping, surface damage, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage

1.8 ENVIRONMENTAL CONDITIONS

- A. Do not install underlayment at ambient or surface temperatures less than 40 degrees F or on wet or frozen substrate.

1.9 PROJECT CONDITIONS

- A. The roofing applicator and sheet metal installer shall verify existing conditions, such as soundness of perimeter conditions, and varying deck and wall thickness for length of anchoring services required and other visible conditions prior to Bidding. Information used in the design was obtained from original design drawings, existing records and site inspection
- B. Conflicts and problems shall be reported to the Architect prior to Bidding, for resolution. Failure to report these conflicts and problems places the responsibility on the Prime Contractor to complete the work in accordance with the Documents at no additional cost to the Owner
- C. Replace or restore to original condition any materials or work damaged during construction.
- D. Surfaces not designated to receive the system shall be properly masked or otherwise protected against accidental spillage or application of the material to those areas
- E. Failure to install the work in strict accordance with provisions of this Section, is subject to total rejection of work specified herein.

1.10 WARRANTIES

- A. Applicator's Warranty: Furnish a **three (3) year** applicator warranty in accordance with the provisions attached "Applicator's Warranty" form attached at the end of this Section.

PART 2 PRODUCTS

2.1 METAL PANEL ROOF AND WALL MANUFACTURERS

- A. Acceptable manufacturers & products for flush metal panel wall panels are as follows:

1.	ATAS International, Inc.	Dutch Seam	www.atas.com
2.	Berridge Manufacturing Co.	Cee-Lock	www.berridge.com
3.	Centria Architectural Systems.	SDP 175	www.centria.com
4.	Drexel Metals, Inc.	DMC 175S	www.drexelmetals.com
5.	Englert, Inc.	S2000 Series	www.englertinc.com
6.	Firestone / Una-Clad	UC-14 Panel	www.firestonebpc.com
7.	Fabral.	Slim Seam	www.fabral.com
8.	Imetco	1 3/4" SnapLok	www.imetco.com
9.	Merchant & Evans, Inc.	Classic Rib	www.ziprib.com

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- | | | | |
|-----|---------------------------------------|-------------|-------------------|
| 10. | Morin Corporation | SWL Profile | www.morincorp.com |
| 11. | Petersen Aluminum Corp. | Snap Clad | www.pac-clad.com |
| 12. | Architect approved equivalent system. | | |

B. Substitutions: Under provisions of Division 1.

2.2 MATERIALS

A. Aluminum Sheet:

1. ASTM B209, alloy 3015-H14 or equivalent.
2. Recycled Content: Minimum 75 percent recycled aluminum, with minimum 40 percent classified as post consumer.

2.3 ACCESSORIES AND FASTENERS

A. Aluminum Sheet Panel Fasteners: Stainless steel or aluminum fasteners approved by the panel manufacturer. (appropriate length for use intended)

1. Provide metal backed neoprene washers under heads of fasteners bearing on weather side of panels
2. Use stainless steel or aluminum fasteners for exterior and interior applications. Lock rivets where required may be aluminum or stainless steel. Use painted fasteners where fastening into painted panel or trim.
3. Locate and space fastenings for true vertical and horizontal alignment. Use proper type fastening tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
4. Where applicable, when replacing existing fasteners utilize existing fastening hole and increase fastener diameter to one size larger and of appropriate length for proper securement.

B. Flexible Panel End Closure Strips: Closed cell, expanded cellular rubber, self-extinguishing, cut or pre-molded to match corrugation configuration of roofing and/or siding panels. Provide where indicated and necessary to ensure weathertight construction.

C. Prefabricated Pipe Flashing "Boot": Compression molded EPDM rubber tapered pipe flashing unit with 1" wide flexible aluminum base. Material to be ozone and ultraviolet resistant

1. Approved Manufacturer and Product: Portals Plus, Inc. Bensenville, IL - Deck-Mate. (Basis of Design)
2. Or architect approved equal

D. Joint Sealers: Specified in Section 07900.

E. Miscellaneous Accessories: Except as indicated as work of another specification section, provide components required for a complete roofing system, including trim, coping, fascias, sills, corner units, ridge closures, clips, seam covers, battens, flashing, gutters, louvers, sealants, gaskets, fillers, closure strips and similar items. Match

METAL WALL PANELS SECTION 07413

materials/finishes of preformed painted panels. The same warranty that applies to panel finishes shall apply to sheet metal accessories.

2.4 FABRICATION

- A. General: Provide wall panels roll-formed to profile indicated and specified. Provide flashing, closures, fillers, metal expansion joints, ridge covers, wall panel mounting clips, gable and eave trim, gutters and other sheet metal accessories factory formed and finished. Material and finish shall be as specified.
1. Allowances for thermal expansion: Pre-engineered metal wall panel system shall be designed, fabricated, and installed to allow relative movement between roof panels and purlins, gables and ridges due to thermal expansion and contraction without causing damage to the system or permanent deformation to any of the system components. wall panel end laps shall allow panels to expand and contract without damage to end lap seams.
- B. Metal Wall Panels:
1. Materials: Fabricate panels from Aluminum; 0.040 inch minimum, roll formed, smooth (non-embossed), aluminum sheet, 3105H274 aluminum per AA standards.
 2. Panel Profile: One (1) inch deep (maximum) flush seams spaced twelve (12) inches on center with interlocking edges intended to be mechanically fastened to the substrate below with concealed fasteners. Intermediate stiffening ribs within the field of the panel are permitted, but not required. Panels shall be designed to provide full seam side laps when installed.
 3. Trim: Profiles as indicated or as required, fabricated from same material and finish as panels, unless specifically noted otherwise.
 4. Panel Length: Roll-form panels and trims to required profiles in longest practical lengths. Wall panels are to be continuous from top to bottom; intermediate end laps are not permitted.

2.5 FINISHES

- A. Panels and Trim: Panels shall be factory painted with a full strength fluoropolymer finish. Paint shall contain 70-75% KYNAR 500 resin and applied, (0.80 mils thickness), over manufacturer's primer, (0.20 mils thickness), with a total system thickness of 1.00 mils per ASTM D 1400. Gloss to be 20-30% per ASTM d 523 at 60 degrees. Architect will select color from manufacturer's color chart. Back side shall be factory painted with polymer paint.
1. Panel colors:
 - a. Standing seam metal panels – Select with owner from manufacturer's standard and metallic color pallet.
 - b. Flush metal wall panels – Select with owner from manufacturer's standard color pallet.
 - c. Structural Metal Panels – Select with owner from manufacturer's standard and metallic color pallet.

PART 3 EXECUTION

3.1 GENERAL

- A. Pre-engineered metal wall system shall be installed in strict conformance with manufacturer's instructions. wall panels shall be installed to allow for relative movement between wall panels and ridge, gables, fascias and other components of the roof system

3.2 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify substrate is supported and secured.
- C. Verify substrate is clean and smooth, free of depressions, waves, or projections and properly sloped.
- D. Verify substrate surfaces are dry. If applicable, verify flutes of metal deck are clean and dry.
- E. Verify roof openings, curbs, pipes, conduit, sleeves, ducts, and vents through roof are solidly set, and cant strips and reglets are in place

3.3 INSTALLATION OF METAL WALL PANELS

- A. Install in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Install aligned, level, and plumb.
- C. The existing wall system substrate consists of 5/8" thick stucco over concrete block. In areas above the clerestory windows, new 5/8" plywood will be installed over the aluminum framing to make the substrate flush for the new metal wall panel system. Fasten panels to the existing concrete block through the stucco and new plywood sheathing after it has been attached to the aluminum framing as required by the manufacturer. Field verify attachment conditions prior to bidding. Anchorage size, type and locations to be defined by the roofing manufacturer's project specific engineering. Exposed fasteners are permitted at trim members where detail only.
- D. Install trim to maintain visual continuity of system.
- E. Install headwall flashings for new windows and trim around the new window system as shown in the details provided.
- F. Install joint sealers and gaskets to prevent water penetration.
- G. Flash penetrations through wall with metal trim to match panels:

**METAL WALL PANELS
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1. Lap flashings over wall panels 12 inches minimum on all sides and seal with double bead of joint sealer.
2. Install metal draw band and joint sealer at top of pipe penetrations.
3. Install headwall flashings above windows and penetrations in the elevations.

H. Installation Tolerances:

1. Variation from location: Plus or minus 1/4 inch.
2. Variation from plane: 1/4 inch in 10 feet.

3.4 ADJUSTING AND TOUCH-UP PAINTING

- A. Apply manufacturer's supplied touch-up paint, at the discretion of the Architect, to any scratches or scrapes or other deficiencies in the painted metal finish
- B. All raw edges of the metal wall panels or flashing which may be left exposed due to either factory or field cutting and may be subject to corrosion are to receive manufacturer's supplied touch-up paint.

3.5 CLEANING AND PROTECTION

- A. Cleaning: Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashing and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

END OF SECTION

APPLICATOR WARRANTY FOR ROOFING

Whereas _____

of (Address) _____

herein called the "Roofing Contractor", has performed roofing, flashing and sheet metal and associated ("work") on following project:

Owner: _____

Address: _____

Name and Type of Building: _____

Address: _____

Area of Work: _____

Date of Acceptance: _____

Warranty Period: **Three (3) Years** Date of Expiration: _____

The Roofing Contractor hereby certifies to the Owner as a "Final Statement of Compliance" that the finished roof replacement system was installed in compliance with the approved contract documents.

AND WHEREAS Roofing Contractor has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period.

NOW THEREFORE Roofing Contractor hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work, and as are necessary to maintain said work in watertight condition.

This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to roofing work and other parts of the building, and to building contents, caused by: a) lightning, windstorm; b) fire; c) failure of roofing system substrate or structure (including cracking, settlement, excessive deflection, deterioration, and decomposition). When work has been damaged by any of the foregoing causes, Warranty shall be null and void until such damage has been repaired and until cost or repairs has been paid by the Owner or by another responsible party as so designated.
2. The Roofing Contractor is responsible for damage to work covered by this Warranty, and is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.
3. The Owner shall promptly notify Roofing Contractor of observed, known or suspected leaks, defect or deterioration. The Contractor shall guarantee to respond to all notifications within twenty four (24) hours and to make all such repairs as deemed necessary to correct said leaks or defects to a satisfactory condition to the Owner. Repairs shall be made by workman in the current employment of the Contractor. Subcontracting of repair work is not permitted.

APPLICATOR'S WARRANTY – PAGE 2

4. The definition of faulty roofing components or roofing in disrepair includes, but is not limited to the following:
 - a. Failures of applicator applied finishes at any metal flashing components.
 - b. Cracks or breaks in metal roof panels or flashing components.
 - c. Disengagement of flashing from concealed cleats.
 - d. Defects in the quality of work or materials.
 - e. Leaks of any kind.

5. This Warranty is recognized to be the only warranty of Roofing Contractor on said work, and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to him in cases of roofing failures. Specifically, this Warranty shall not operate to relieve Roofing Contractor of responsibility for performance of original work in accordance with requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been duly executed this

_____ day of _____, 20_ _____

Roofing Contractor Firm (SEAL)

Signature of Authorized Person Printed Name and Title

THERMOPLASTIC SINGLE PLY ROOFING

SECTION 07532

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Drawings, the general provisions of the Contract, including General and Supplementary Conditions and Division 1 requirements apply to work in this Section
 2. Single-ply thermoplastic roofing system, insulation, flashing and roofing accessories, integrally related to roof installation.
 3. Related work.
 4. Applicator Warranty for Roofing form, to be submitted upon completion of the project.
- B. Related Sections:
1. Section 02070 - Selective Demolition: Removal of existing rooftop fixtures and equipment.
 2. Section 06100 - Rough Carpentry: Wood nailers, blocking and curbs.
 3. Section 07015 - Preparation for Re-Roofing
 4. Section 07620 - Sheet Metal Flashing and Trim

1.2 REFERENCES

- A. ASTM International
1. ASTM D 471 - Test Methods For The Effects of Rubber- Liquid Properties
 2. ASTM D 751 - Test Method of Coated Fabrics
 3. ASTM D 882 - Test Method for Tensile Properties of Thin Plastic Sheathing
 4. ASTM D 1204 - Test Method for Linear Dimensional Changes of Non-rigid Thermoplastic Sheeting or Film at Elevated Temperature
 5. ASTM D 2136 - Test Method for Coated Fabricates -Low Temperature Bend Test
 6. ASTM D 2240 - Test Method for Rubber Property
 7. ASTM D 6754 - Standard Specification for Ketone Ethylene Ester Based Sheet Roofing
 8. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials
- B. NFPA
1. NFPA 255 - Test of Surface Burning Characteristics of Building Materials
- C. FM Global
1. FM – Roof Assembly Classifications
 2. FM DS 1-28 – Wind Loads to Roof Systems and Roof Deck Securement
 3. FM 4450 – Approval Standard for Class 1 Insulated Steel Deck Roofs
- D. NRCA (National Roofing Contractors Association)
1. NRCA - Roofing and Waterproofing Manual

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- E. Underwriters Laboratories, Inc.
 - 1. UL - Fire Hazard Classifications
 - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials
 - 3. UL 790 – Tests for Fire Resistance of Roof Covering Materials.
 - 4. UL 1256 – Fire Test of Roof Deck Construction
 - 5. UL 1897 – Uplift Tests for Roof Covering Systems.

1.3 DESIGN REQUIREMENTS (SYSTEM DESCRIPTIONS)

- A. Existing Metal Deck and Rigid Insulation Substrates: Mechanically fasten 60 Mil smooth surfaced Elvaloy based thermoplastic single-ply membrane to metal deck through 1/2" thick gypsum roof board fastened over new 2" thick non-tapered rigid insulation installed over existing rigid insulation. Install new crickets with tapered rigid insulation to improve drainage as shown in the drawings. Tapered insulation to produce a minimum finished roof slope of 1/4" per foot. Single ply flashing shall be fully adhered to interior face of parapet walls.
- B. Existing Lightweight Insulating Concrete Substrates: Adhere 60 Mil smooth surfaced Elvaloy based thermoplastic single-ply membrane to a 1/2" thick gypsum roof board adhered over new 3" thick non-tapered rigid insulation adhered to a torch applied preliminary roof over a mechanically fastened venting base sheet over lightweight concrete deck. Install new crickets with tapered rigid insulation to improve drainage as shown in the drawings. Tapered insulation to produce a minimum finished roof slope of 1/4" per foot. Single ply flashing shall be fully adhered to interior face of parapet walls.
- C. Existing Metal Deck Substrates: Mechanically fasten 60 Mil smooth surfaced Elvaloy based thermoplastic single-ply membrane through 1/2" thick gypsum roof board and new 1/4" per foot tapered rigid insulation to existing metal deck below. Install the taper pattern with four-way slope as shown in the drawings. Single ply flashing shall be fully adhered to interior face of parapet walls.
- D. Existing Concrete Deck Substrates: Adhere 60 Mil smooth surfaced Elvaloy based thermoplastic single-ply membrane to a 1/2" thick gypsum roof board adhered over new 4" thick non-tapered rigid insulation adhered to a torch applied preliminary roof over the existing concrete deck. Install new crickets with tapered rigid insulation to improve drainage as shown in the drawings. Tapered insulation to produce a minimum finished roof slope of 1/4" per foot. Single ply flashing shall be fully adhered to interior face of parapet walls.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Provide membrane materials, base flashing materials, insulation, fanfold insulation board and vapor retarders.
- C. Manufacturer's Installation Instructions: Indicate special precautions required for seaming the membrane.

THERMOPLASTIC SINGLE PLY ROOFING SECTION 07532

- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Field Reports: Submit under provisions of Division 1.
- F. Contractor shall submit certification from a Florida Registered Engineer showing that the new roof system meets or exceeds current ASCE 7-10 and the 2014 Florida Building Code, 5th Edition wind pressure requirements. (Provide supporting calculations)
- G. All products used shall be asbestos free.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual except where NRCA details differ from the project manual details.
- B. Maintain one copy of the NRCA document on site.
- C. Work that is closely associated with flexible sheet roofing, including vapor barriers, insulation, flashing and counterflashing, expansion joints (if applicable), and joint sealers, is to be performed by the installing applicator of the primary roofing system.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with five years current documented experience.
- B. Applicator: A single installer specializing in performing the work of this section with three current years documented experience and approved by system manufacturer.
 - 1. The installation shall be done by a roofer approved in writing by the manufacturer of the thermoplastic material.
- C. Supervisor: Maintain a full-time non working supervisor, on job site during roofing work in progress. Supervisor shall have five current years minimum documented experience of roofing work similar to scope of specified roofing.
- D. Manufacturer's Field Inspection and Services Representative:
 - 1. Manufacturer of the roofing materials shall provide qualified personnel to observe field conditions of surfaces and installation, quality of workmanship as applicable, and to make appropriate recommendations.
 - 2. Representative shall visit the Project throughout progress of the work.
 - a. Initial pre-installation meeting.
 - b. Site visits at maximum of one week intervals.
 - c. Prior to Substantial Completion inspection, a final inspection shall be made by manufacturer's representative.
 - d. Called meetings.

THERMOPLASTIC SINGLE PLY ROOFING SECTION 07532

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable code for roof assembly fire hazard requirements and regulations of jurisdictional authorities, 2014 Florida Building Code, 5th Edition.
- B. All roofing materials to be Class A as tested in compliance with ASTM E 108 -Standard Test Methods for Fire Tests of Roof Coverings.
- C. FM: Roof Assembly Classification, Class 1 Construction.
- D. Material Safety Data Sheets (MSDS): For all roofing products.
- E. Contractor shall submit certification from a Florida Registered Engineer showing that the new roof system meets or exceeds current ASCE 7 and the 2014 Florida Building Code, 5th Edition wind pressure requirements for ultimate wind speed of **149 mph (115 mph Nominal/Actual)**. (Provide supporting calculations)

1.8 CERTIFICATION

- A. Materials: For each material specified with a standard or reference material designation, certification labels shall appear on each package of bulk-shipments to project with certificate of compliance.
- B. Installer: Provide two copies of all certification to Architect prior to beginning roofing work.

1.9 PRE-INSTALLATION CONFERENCE

- A. Convene meeting one week prior to commencing work of this section at project site, with 72 hours minimum notice to participants. Meeting to include Contractor, Roofer, and Subcontractors, governing authorities, test agencies, product manufacturers, Architect and the Owner Representative.
- B. Review requirements, Contract Documents, submittals, sequencing, availability of materials and installation facilities, proposed installation schedule, requirements for inspections and testing or certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures.
- C. Record discussion on matters of significance; furnish copy of recorded discussions to each participant. Discuss roofing system protection requirements for construction period extending beyond roofing installation/

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver to site, store, protect, and handle products under provisions of Division 1.
- B. Deliver material in manufacturer's original, unopened containers with manufacturer's labels intact and legible.

THERMOPLASTIC SINGLE PLY ROOFING SECTION 07532

- C. Deliver material requiring fire resistance classification to the job with labels attached and packaged as required by labeling service.
- D. Deliver enough material to allow continuous work.
- E. Store rolls, cans and drums of cements, primers, and coatings, on end and over clean raised platforms.
- F. Store and handle materials to protect them from.
 - 1. Moisture, whether due to precipitation, or condensation.
 - 2. Damage by construction traffic.
 - 3. Temperatures over 110 degrees F or below 40 degrees F.
 - 4. Mud, dust, sand, oil and grease.
- G. Select and operate material handling equipment and store materials to keep from damaging existing construction or applied roofing.
- H. Immediately remove and dispose of wet materials.
- I. Comply with fire, safety, and environmental protection regulations.
- J. Do not store materials on roof decks, nor position roofing installation equipment on roof decks, in concentrations exceeding design live loads.
- K. Take special precautions against traffic on roofing when ambient temperature is above 80 degree F. Avoid heavy traffic on the work during installation.

1.11 PROJECT CONDITIONS

- A. Existing Conditions:
 - 1. The roofing applicator and sheet metal installer shall verify existing conditions, such as soundness of perimeter conditions, and varying deck and wall thickness for length of anchoring services required and other visible conditions prior to Bidding.
 - 2. Report conflicts and problems to the Purchasing and Contracts Division for resolution prior to Bidding. Failure to report these conflicts and problems places the responsibility on the Prime Contractor to complete the work in accordance with the Documents at no additional cost to the Owner.
 - 3. Replace or restore to original condition any materials or work damaged during construction.
 - 4. Surfaces not designated to receive the system shall be properly masked or otherwise protected against accidental spillage or application of the material to those areas.
 - 5. Failure to install the work in strict accordance with provisions of this Section, is subject to total rejection of work specified herein.

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1.12 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply roofing membrane during inclement weather ambient temperatures below 40 degrees F.
- B. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
- C. Proceed with roofing work when existing and forecasted weather conditions permit work to be performed in accordance with requirements of this section and warranty compliance requirements.

1.13 COORDINATION

- A. Coordinate work under provisions of Division 1.
- B. Coordinate the work with installing associated wood blocking and nailers, roofing, expansion joints and area dividers, and metal flashing as the work of this section proceeds.

1.14 SEQUENCING

- A. Organize operations so work can simultaneously proceed on the various aspects including roofing and flashing so at the end of each day the work done that day will be substantially complete.
- B. Roof area shall be substantially complete prior to beginning another roof area; utilize multiple crews for multiple roof area construction. Phasing of roof construction by area is not permitted.
- C. Sequence equipment removal with covering of deck openings with plywood strong enough to prevent injuries from falling through. Contractor shall install waterproof covering over plywood and tie-in to existing membrane to achieve complete watertightness.

1.15 WARRANTY

- A. Applicator's Warranty: **Three (3) year workmanship warranty.** (Refer to "*Applicator's Warranty for Roofing*" at end of this Section). **Submit upon completion of Work.**
- B. Manufacturer's Warranty:
 - 1. The Manufacturer's Warranty shall contain a detailed description of the components of the manufacturer's system proposed and a list of any other component and accessories, proposed for use in the system that is provided by other manufacturers or suppliers.
 - a. A statement that the Manufacturer's Representative has visited this site and reviewed the job conditions and project manual. Having reviewed the above items in detail, the Representative will provide a written

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- response if conflicts between the Manufacturer's requirements occur with the documents.
2. The manufacturer shall delete all exceptions relative to system failure from high wind uplift pressures due to gale force winds and windstorms below the following ASCE 7-10 "Unfactored" (Actual) Wind Uplift Pressures:
 - a. Interior of Roof (Zone 1): -47.60 psf
 - b. Perimeter of Roof (Zone 2): -74.84 psf
 - c. Corners of Roof (Zone 3): -102.00 psf
 3. **Twenty (20)** year total roof system warranty inclusive of roofing materials, all included products and accessories, including all metal flashings, from roof deck to finish membrane, whether supplied by the membrane manufacturer or by others. Provide a "No Dollar Limit", single source responsibility, non-deductible roofing warranty inclusive of all material and labor in full compliance with all the requirements of the project specifications.
 - a. If the manufacturer fails and/or refuses to issue the required roof warranty, the Contractor with Surety shall warrant to make repairs, replacement or take corrective action on the same terms as required of the manufacturer, (had the warranty been issued by the manufacturer), so that the intended warranty is delivered to the Owner.
 - b. The manufacturer shall modify the roof warranty to include total labor coverage for the warranty period and to Cover damage to roof materials and insulation down to the roof deck resulting from water penetration.
 - c. The manufacturer shall modify the roof warranty to state that the Owner has the right to make emergency repairs without voiding the warranty if the manufacturer or applicator do not respond within 24 hours to notification by the Owner of a defect or leak.
 - d. The manufacturer shall modify the roof warranty to state that annual inspections with written reports by the Owner, and resulting maintenance, are sufficient to fulfill the periodic inspection requirements of the manufacturer's warranty.
 4. The manufacturer's Representative shall conduct a Post-Construction field inspection no earlier than **eleven (11) months**, and no later than **twelve (12) months** after the Date of Substantial Completion. Submit a written report within seven (7) days of this visit to the Owner's Maintenance Dept. listing observations, conditions and any recommended repairs or remedial action.
 5. The manufacturer will, during the **second (2nd)**, and **fifth (5th)**, year of this warranty, inspect the roof system and provide a written Executive Summary of the Roof Condition to the Owner.

PART 2 PRODUCTS

2.1 THERMOPLASTIC ROOFING SYSTEM

- A. Manufacturers and Approved Products for adhered system:
 1. Obtain primary thermoplastic roofing from a single manufacturer and provide secondary materials only as recommended by the manufacturer of the primary material, as specified.

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square feet. SBS membrane ply shall be reinforced with a 170 gram/square meter minimum non-woven polyester mat(s), shall conform to the requirements of ASTM D 6164, Type I, Grade S, and be a component within a Class A roofing system as tested in compliance with ASTM E 108. Acceptable manufacturer's and products are as follows. **Substitutions are not permitted:**

1. Firestone SBS Torch Smooth
2. GAF Ruberoid SBS Heat-Weld Smooth
3. John Mansville DynaWeld 180 Smooth
4. Polyglass Elastoflex S6
5. Soprema Sopralene 180 SP 3.5
6. Architect approved (prior to bidding) equivalent product.

- D. Dry-In Membrane: Self-adhering, 40 mil thick, polyester reinforced, SBS modified asphalt waterproofing and underlayment membrane sheet to be one of the following:
1. Interwrap Titanium PSU
 2. Protecto-Wrap "Rainproof-40"
 3. Soprema "LastaBond TU"
 4. Tamko "TW Metal and Tile" underlayment.
 5. W.R. Grace Ice & Water Shield
 6. Architect approved (prior to bidding) equivalent product.

2.3 MECHANICAL FASTENERS

- A. For fastening plywood sheathing to structural steel: #10 diameter self-drilling, self-tapping screws with "wings" at 12" o.c. (maximum) at edges and 16" o.c. (maximum) in the field. Length as required for 1/2" minimum penetration of threads through steel.
- B. For fastening plywood sheathing to light gage metal framing: #10 diameter self-tapping "deck" screws at 12" o.c. (maximum) at edges and 16" o.c. (maximum) along each framing member length as required for 1/2" minimum penetration through framing. Framing to be spaced at 24" o.c. maximum, unless noted otherwise.
- C. For fastening flashing to wood: Stainless steel annular threaded, 11 or 12 gage shanks, 1" long, driven through a minimum 30 gage 1" diameter flat stainless steel cap.
- D. For mechanical attachment of roof membrane: Mechanically fasten roofing membrane to metal deck in accordance with approved manufacturer's recommendations complying with current ASCE 7 and FBC wind up-lift criteria. Length requirements: Minimum penetration into steel decking is 1 inch.
- E. For supplemental attachment of roof membrane (at corners and perimeter) : Mechanically fasten roofing system where designated to metal deck in accordance with approved manufacturer's recommendations complying with current ASCE 7 and FBC wind up-lift criteria. Length requirements: Minimum penetration into steel decking is 1 inch.
- F. For all other locations: Provide size, type, material and finish as required, matching material being fastened.

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2.4 INSULATION FOR NEW CRICKETS

- A. Polyisocyanurate Insulation: Closed cell glass fiber reinforced type, as approved for use within a 20 year warranted roof system by the roofing manufacturer, and conforming to the following:
1. Board Density: 2 lb/cu ft.
 2. Board Size: 4x4 feet when adhered, 4 x 8 feet if mechanically attached.
 3. Minimum Thickness: 1/4" at the edge of the internal drains.
 4. Tapered System Finished Slope: 1/4" per foot, 1/2" per foot at crickets.
 5. Compressive Strength: 25 psi ASTM C 165-05
 6. Facing: Factory applied skin of glass fiber facing on both faces.
 7. Board Edges: Square.
 8. Water Absorption: In accordance with ASTM C209, 1 percent by volume maximum.
 9. Foam Core Flame Spread: 25 Max. - ASTM E-84 (Tunnel Test).
 10. ULI Fire Rating: Conform to the current ULI, Class A, Roof/Ceiling fire rated assemblies (see current ULI "Fire Resistance Directory").
- B. Tapered Edge Strips For Use with Tapered Insulation: 12" wide, 1/2" per foot tapered preformed units of material matching insulation at crickets. 12" x 1" at roof drain sumps see plans.

2.5 GYPSUM ROOF BOARD

- A. Gypsum Roof Board (Glass fiber reinforced/faced gypsum): as approved for use within a 20 year warranted roof system by the roofing manufacturer, with the following characteristics:
1. Board Type: manufacturer standard product for use over polyisocyanurate insulation and over metal decks.
 2. Manufacturer and Product: Georgia-Pacific Corporation, Gypsum Division, Dens-Deck Prime Roof Board or approved equal.
 3. Board Size: 4' x 8' x 1/2" thick if fastened. (4' x 4' x 1/2" thick if adhered)
 4. Compressive Strength: Minimum 35 psi.
 5. Water Absorption: In accordance with ASTM C 1177-91
 6. Board Edges: Square.
 7. UL Fire Rating: Conform to the current UL, Class A, Roof/Ceiling fire rated assemblies (see current UL "Fire Resistance Directory").
- B. Contractor's Option: Gypsum Roof Board (Glass fiber reinforced with no face layer) : as approved for use within a 20 year warranted roof system by the roofing manufacturer, with the following characteristics:
1. Board Type: manufacturer standard product for use over polyisocyanurate insulation and over metal decks.
 2. Manufacturer and Product: United States Gypsum Company, Securock Roof Board or approved equal.
 3. Board Size: 4' x 8' x 1/2" thick if fastened. (4' x 4' x 1/2" thick if adhered)
 4. Compressive Strength: Minimum 1,250 psi.
 5. Water Absorption: 10 In accordance with ASTM C 473

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6. Board Edges: Square.
7. UL Fire Rating: Conform to the current UL, Class A, Roof/Ceiling fire rated assemblies (see current UL "Fire Resistance Directory").

2.6 WOOD

- A. See Section 06100 – Miscellaneous Rough Carpentry

2.7 DOUBLE SIDED ADHESIVE FLASHING TAPE

- A. Approved manufacturers:
 1. Protecto Wrap Company
 2. Polyken
 3. W.R. Grace

2.8 MISCELLANEOUS MATERIALS:

- A. All other materials and accessories, not specifically described, but required for a complete and proper installation of roofing, shall be products of, or recommended by the primary roof material manufacturer and with Architect's approval.

PART 3 EXECUTION

3.1 GENERAL

- A. Total Installation Concept:
 1. The specified system is a total roofing system, not a patched up, chopped up, spliced or added to or on roofing system. Therefore, this type of application will not be acceptable.
 2. If a section of roof requires reworking or patching, the entire area or section of roofing shall be replaced. This shall mean from edge to edge of roof.
- B. Manufacturer's Installation Requirements:
 1. In addition to the specified procedures, the roofing installer shall install roofing in accordance with the procedures required by the roofing material manufacturer for the proper execution of the work and issuance of the warranty.
 2. The roofing installer shall review the specified procedures for possible conflicts, prior to Bidding, for resolution by Architect.
- C. Watertightness Imperative:
 1. The work specified shall not preclude the use of procedures that will maintain the building watertight. Therefore, the Contractor, while conforming to these contract documents, shall utilize skill and procedures to keep water out of these buildings while construction is in progress.
 2. At the end of each day's roofing installation and prior to the onset of inclement weather, the new section of roofing shall be temporarily sealed with cut-offs to the unfinished substrates, projections through the roof and to the surrounding

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intersections so that no moisture may enter roofing or into structure before work resumes. Remove cutoffs before work resumes.

- D. Insurance Code Compliance:
 - 1. Install system for (and test where required to show) compliance with governing regulations and with the following requirements.
 - a. Underwriters Laboratories Class "A "Fire Classified.
 - b. Current 2014 Florida Building Code, 5th Edition and ASCE 7-10 wind up-lift resistance criteria
- E. Coordinate the installation of insulation, roofing sheets, flashing, stripping, coatings and surfacings, so that membrane edges are not exposed to precipitation or exposed overnight. Provide cutoffs at end of each day's work to cover exposed sheets and insulation.

3.2 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secured.
- C. Verify existing insulation to remain is clean and smooth, free of depressions, waves, or projections, properly sloped to eaves.
- D. Verify existing insulation to remain surface is dry. Verify flutes of metal deck are clean and dry.
- E. Replace existing damaged insulation as needed.
- F. Verify roof openings, curbs, pipes, conduit, sleeves, ducts, roof drains and vents through roof are solidly set.

3.3 INSTALLATION REQUIREMENTS

- A. Drilling through the roof deck will not be allowed one day prior to a show starting. This will allow for any damage or interruption of service to be repaired prior to the show beginning. This repair will be taken out of the \$10,000 lump sum listed in the Summary of Work in Section 01010.
- B. Protect other work from spillage of roofing materials and prevent liquid materials from entering or clogging drains and conductors. Replace/restore other work damaged by installation of roofing system work.
- C. Insurance/Code Compliance: Install system for (and test where required to show) compliance with governing regulations and with the following requirements:
 - 1. Underwriters Laboratories "Fire Classified" and "Class A", the 2014 Florida Building Code, 5th Edition and ASCE 7 for **Nominal 115 mph ; Ultimate 149 mph** wind up-lift resistance.

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3.4 APPLICATION OF BASE SHEET & PRELIMINARY ROOF (OVER LWIC ONLY)

- A. Venting Base Sheet:
1. Start with 18" width at the low edge, followed by full width sheets.
 2. Lap the venting base sheet 4 inches at edges and ends.
 3. Mechanically fasten base sheet in accordance with the prescribed attachment requirements as detailed within the project documents, or as determined by the roof system manufacturer due to the project wind uplift criteria (most stringent to govern).
 4. At parapet walls, extend the venting base sheet up and over the wall covering and wood blocking where necessary for venting.
 - a. Nail venting base sheet to the wall at 8" on center in each direction.
 - b. Apply flashing adhesive at side laps (or end laps) and over nail heads to keep wall flashing watertight until the multiple ply flashing and modified bitumen flashing is installed.
- B. Preliminary Roof Application (After venting base sheet application):
1. Install a SBS modified bitumen interply sheet, lapped, shingled in proper direction to drain water to roof drain locations), with torch-adhered application.
 2. Overlap ends of connecting plies (end lap) minimum of 10 inches. Remove all factory splices from rolls.
 3. Apply membrane smooth, free from air pockets, wrinkles, or tears. Ensure full bond of membrane to substrate.
 4. Seal membrane around all roof protrusions and penetrations.
 5. Allow sufficient "bleed out" at membrane edges to ensure proper bonding.
 6. Contractor shall maintain a daily "fire watch" for a minimum of two (2) hours after torch down shift has been completed.

3.5 PREPARATION FOR INSULATION APPLICATION

- A. Rigid insulation is to be installed over the preliminary roof membrane where applicable, or over existing rigid insulation prior to the installation of the membrane system.
- B. The Contractor shall verify field dimensions for determining a positive drainage slope.
- C. Install only as much insulation board in any one day as can be covered by a completed waterproof membrane in the same day.
- D. Prior to insulation board application, remove excess dust, loose granules and foreign materials from surface of the substrate by brooming and powered blowers or vacuums.
- E. Contractor shall insure that slopes indicated on the drawings are "finish" slopes, regardless of irregularities and deviations in the roof deck or substrate.

3.6 INSTALLATION OF RIGID INSULATION

- A. System descriptions (See the Roof Characteristics Schedule on Sheet G01 in the project drawings for specific roof areas):
1. Non-tapered and tapered insulation

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2. ¼" per foot tapered insulation
 3. Install ½" per foot finish slope crickets behind mechanical units or curbs.
 4. Install ¼" per foot finish slope crickets in areas shown in the plans provided over new non-tapered rigid insulation.
- B. Install rigid insulation per the project plans and details, valley lines are to extend out from the roof drains at an approximate 45 degree angle. Adhere or fasten as approved by the manufacturer.
- C. Install crickets on "high" side of roof top equipment curbs prior to installation of the gypsum roof board. Adhere with a manufacturer approved insulation adhesive.
- D. Install 4' x 4' sumps at all internal roof drains as shown in the plans and details provided.
- E. Adhere or fasten a subsequent layer of ½" minimum thickness, fiberglass reinforced gypsum cover board over the tapered rigid insulation board system with a manufacturer approved insulation adhesive or fastener, (butt boards tightly). Cover all joints with tape (if required by the manufacturer) and fully prime top surface of the gypsum cover board.
- F. Apply tapered edge strips or cementitious filler compound as necessary to provide a smooth transition between slight elevation changes at the edge of the tapered rigid insulation or the gypsum roof board.

3.7 APPLYING GYPSUM COVER BOARD

- A. Apply boards laid in parallel courses with long joints continuous and no joints broken. Mitering of taper boards at valleys, in lieu of lacing is required.
- B. Edge of boards shall be butted firmly to adjoining board with no gaps. Smooth any surface irregularities or unevenness between boards in top layer of boards prior to roofing.
- C. Loose lay insulation boards over tapered insulation and cut to fit as needed, removing excess debris and extra pieces.
- D. Contractor shall insure that slopes indicated on the drawings are "finish" slopes, regardless of irregularities and deviations in the roof deck or substrate.
- E. Fully adhere or fasten a single layer of the gypsum roof board to the rigid insulation per the manufacturer.
- F. Prior to roof membrane application, remove excess dust from surface of board insulation by brooming, blowing and/or vacuuming.

3.8 APPLYING THERMOPLASTIC ROOFING SYSTEM (WHERE FULLY ADHERED)

- A. General:

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1. Organize the various aspects of the work so at the end of each day the area completed on that day is substantially complete.

- B. Field Sheets (Prefabricated Rolls)
 1. Un-roll approximately 30 feet of the membrane and position the roll over the properly installed/prepared substrate. Pull the tail back over the roll to expose a workable area (approx. 30') of substrate.
 2. Apply a 100% continuous coat of adhesive to the substrate, (and underside of membrane if using "contact" adhesive).

- C. Procedure:
 1. The amount of substrate that can be coated with a workable amount of adhesive will be determined by application method, ambient temperature, humidity and available man power.
 2. To insure proper application and curing of the adhesive, it is recommended that the outside air temperature be above 40 F.
 3. Adhesive may be applied by roller or by spraying.
 4. Roller applied adhesive should utilize a solvent resistant 1/2" nap roller.
 5. Spray applied adhesive must be spread out by roller to insure a smooth, even, 100% coverage of the substrate with no globs, puddles or similar irregularities.
 6. Allow the solvents in the adhesive to dissipate to the point that the adhesive is stringy to the touch. Do not allow adhesive to "dry out" completely.

- D. Hot Air Welding:
 1. General:
 - a. All field seams exceeding 10 feet in length shall be welded with an approved automatic welder.
 - b. All field seams must be clean and dry prior to initiating any field welding.
 - c. Remove foreign materials from the seams (dirt, oils, etc.) with acetone or approved alternative. Use clean cotton cloths and allow approximately five minutes for solvents to dissipate before initiating the automatic welder. Do not use denim or synthetic rags for cleaning.
 - d. All welding shall be performed only by qualified personnel to ensure the quality and continuity of the weld.
 2. Hand Welding
 - a. The lap or seam area of the membrane would be intermittently tack welded to hold the membrane in place.
 - b. The back "interior" edge of the membrane shall be welded first, with a thin, continuous weld to concentrate heat along the exterior edge of the lap during the final welding pass.
 - c. The nozzle of the hand-held hot air welder shall be inserted into the lap at a 45° angle to the lap. Once the polymer on the material begins to flow, a hand roller shall be used to apply pressure at a right angle to the tip of the hand welder. Properly welded seams shall utilize a 1-1/2" wide nozzle, to create a homogeneous weld, a minimum of 1-1/2" in width.
 - d. Smaller nozzles may be used for corners and other field detailing, maintaining a minimum 1" weld.
 3. Automatic Machine Welding:

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- a. Proper welding of the membrane can be achieved with a variety of automatic welding equipment. Refer to manufacturer's specific recommendations and requirements.
- b. Follow all manufacturer's instructions for the safe operation of the automatic welder.
- c. Follow local code requirements for electric supply, grounding and surge protection.
- d. The use of a dedicated, portable generator is highly recommended to insure a consistent electrical supply, with fluctuations that can interfere with weld consistency.
- e. Properly welded seams shall utilize a 1-1/2" wide nozzle, to create a homogeneous weld, a minimum of 1-1/2" in width.

3.9 APPLYING THERMOPLASTIC ROOFING SYSTEM (WHERE MECHANICALLY FASTENED)

- A. General
 1. Organize the various aspects of the work so at the end of each day the area completed on that day is substantially complete.
- B. Field Sheets (Prefabricated Rolls)
 1. Rolls shall be installed straight to chalk lines maintaining the best lay flat characteristics possible.
 2. Adjoining rolls shall overlap the fastened edge a minimum of 5" maintaining proper shingling to avoid back water seams. (See manufacturer's details for fastener spacing location.)
- C. Membrane Attachment:
 1. Un-roll the membrane and position it over the properly installed/prepared substrate.
 2. Mechanically fasten roofing system to metal decking in accordance with manufacturer's instructions which must comply with current ASCE 7 and FBC wind up-lift criteria.
- D. Hot Air Welding:
 1. General:
 - a. All field seams exceeding 10 feet in length shall be welded with an approved automatic welder.
 - b. All field seams must be clean and dry prior to initiating any field welding.
 - c. Remove foreign materials from the seams (dirt, oils, etc.) with acetone or approved alternative. Use clean cotton cloths and allow approximately five minutes for solvents to dissipate before initiating the automatic welder. Do not use denim or synthetic rags for cleaning.
 - d. All welding shall be performed only by qualified personnel to ensure the quality and continuity of the weld.
 2. Hand Welding
 - a. The lap or seam area of the membrane would be intermittently tack welded to hold the membrane in place.

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- b. The back "interior" edge of the membrane shall be welded first, with a thin, continuous weld to concentrate heat along the exterior edge of the lap during the final welding pass.
 - c. The nozzle of the hand-held hot air welder shall be inserted into the lap at a 45° angle to the lap. Once the polymer on the material begins to flow, a hand roller shall be used to apply pressure at a right angle to the tip of the hand welder. Properly welded seams shall utilize a 1-1/2" wide nozzle, to create a homogeneous weld, a minimum of 1-1/2" in width.
 - d. Smaller nozzles may be used for corners and other field detailing, maintaining a minimum 1" weld.
3. Automatic Machine Welding:
- a. Proper welding of the membrane can be achieved with a variety of automatic welding equipment. Refer to manufacturer's specific recommendations and requirements.
 - b. Follow all manufacturer's instructions for the safe operation of the automatic welder.
 - c. Follow local code requirements for electric supply, grounding and surge protection.
 - d. The use of a dedicated, portable generator is highly recommended to insure a consistent electrical supply, with fluctuations that can interfere with weld consistency.
 - e. Properly welded seams shall utilize a 1-1/2" wide nozzle, to create a homogeneous weld, a minimum of 1-1/2" in width.

3.10 FLASHING

- A. Clean all vents and stacks to bare metal. All protrusions must properly secured to the roof deck with approved fasteners. Remove and discard all lead, pipe and drain flashing. Flash all penetrations according to approved details.
- B. Remove all loose and/or deteriorated flashing.
- C. All flashing shall be fully adhered to properly prepared, approved substrates with manufacturer's recommended mastic applied in sufficient quantity to insure total adhesion.
- D. The base flange of all membrane flashing shall extend out on to the plane of the deck, beyond the wood nailer to a maximum width of 8 inches.
- E. Vertical flashing shall be terminated no less than 8 inches above the plane of the deck with approved termination bar and counterflashing or metal cap flashing.
- F. Complete all inside and outside corner flashing details with the manufacturers preformed corners or an approved field fabrication detail.
- G. Probe all seams with a dull pointed probe to insure the weld has created a homogeneous bond.

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- H. Install penetration accessories in strict accordance with approved details. Insure penetrations accessories have not impeded in any way the working specification.

3.11 METAL FLASHING

- A. Flashing metal is to be fabricated from PVC coated metal and 24 gage stainless steel as described in Section 07620 – Sheet Metal Flashing and Trim.
- B. Fasten all metal flashing to wood nailers or approved substrate with approved fasteners 8 inches on center.
- C. Break and install coated metal in accordance with approved details. Insure proper attachment with 1/4 inch expansion joints and the installation of a minimum 2 inch bond breaker tape prior to sealing the joint.
- D. Weld a 6 inch strip of membrane over the coated metal expansion joints.

3.12 COMPLETION

- A. Remove any and all debris, excess materials and scrap of any kind from the roof and surrounding premises prior to demobilization.
- B. Inspect all field welds, detailing and terminations to insure a 100% watertight installation.

3.13 CLEANING

- A. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their instructions.
- B. Repair or replace defaced or disfigured finishes caused by work of this section.
 - 1. Trash and scraps are a hazard and shall be collected and disposed of immediately.
 - 2. The applicator shall remove all masking protection equipment, materials and debris from the work and storage areas and leave those areas in an undamaged and acceptable condition.
 - 3. Where existing sod has been damaged, install new sod in an acceptable manner blending the edges of new sod to existing surrounding sod.
 - a. Do not place new sod over existing sod. Excavate so that top plane of new sod will conform to adjacent plane of existing sod. Match new sod with existing sod type

3.14 PROTECTION

- A. Protect building surfaces against damage from roofing work.
- B. Protect surfaces where traffic must continue over finished roof membrane.

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- C. Upon completion of roofing work (including associated work) advise Owner of recommended procedures for surveillance and protection of roofing during remainder of construction period. At the end of the construction period, or at a time when remaining construction work will in no way affect or endanger roofing, make a final inspection of roofing and prepare a written report to Owner and Architect describing nature and extent of deterioration or damage, if any, found in the work.
- D. Repair or replace deteriorated or defective work found at time of final inspection. Repair damages to roofing which occurred subsequent to roofing installation and prior to final inspection. Repair or replace the roofing and associated work to a condition free of damage and deterioration at time of substantial completion.

END OF SECTION

APPLICATOR'S WARRANTY FOR ROOFING

Whereas _____

of (Address) _____

herein called the "Roofing Contractor", has performed roofing, flashing and sheet metal and associated ("work") on following project:

Owner: _____

Address: _____

Name and Type of Building: _____

Address: _____

Area of Work: _____

Date of Acceptance: _____

Warranty Period: **Three Years** Date of Expiration: _____

The Roofing Contractor hereby certifies to the Owner as a "Final Statement of Compliance" that the finished roof membrane (and insulation) system was installed in compliance with the approved contract documents.

AND WHEREAS Roofing Contractor has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks, faulty or defective materials, seam failure, improper attachment of roofing to decking or insulation to decking, waves and fish-mouths in the sheet waterproofing, improper flashing attachment, water ponding, improper installation of roof drains and scuppers, improper installation of roof curbs, roofing components deemed faulty or in disrepair, and workmanship for designated the Warranty Period.

NOW THEREFORE Roofing Contractor hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work, and as are necessary to maintain said work in watertight condition.

This Warranty is made subject to the following terms and conditions.

1. Specifically excluded from this Warranty are damages to roofing work and other parts of the building, and to building contents, caused by:
 - a) lightning, wind above the design limits of this project.
 - b) fire;
 - c) failure of roofing system substrate or structure (including cracking, settlement, excessive deflection, deterioration, and decomposition).

When work has been damaged by any of the foregoing causes, Warranty shall be null and void until such damage has been repaired and until cost or repairs has been paid by the Owner or by another responsible party as so designated.

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2. The Roofing Contractor is responsible for damage to work covered by this Warranty, and is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.
3. The Owner shall promptly notify Roofing Contractor of observed, known or suspected leaks, defect, disrepair or deterioration. The Contractor shall guarantee to respond to all notifications within twenty-four (24) hours and to make all such repairs as deemed necessary to correct said leaks or defects to a satisfactory condition to the Owner. Repairs shall be made by workman in the current employment of the Contractor. Subcontracting of repair work is not permitted.
4. The definition of faulty roofing components or roofing in disrepair includes, but is not limited to the following:
 - A. Blisters in roofing.
 - B. Improper attachment of roofing to decking or insulation to decking.
 - C. Cracks or ridging in roofing membranes.
 - D. Delamination, shears or tears in membrane.
 - E. Improper flashing attachment.
 - F. Water ponding.
 - G. Improper installation of roof drains and scuppers.
 - H. Improper installation of roof curbs.
 - I. Defects in the quality of work or materials.
 - J. Leaks of any kind.
5. This Warranty is recognized to be the only warranty of the Roofing Contractor on said work, and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to him in cases of roofing failures. Specifically, this Warranty shall not operate to relieve Roofing Contractor of responsibility for performance of original work in accordance with requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been duly executed this

_____ day of _____, 20_____.

Roofing Contractor Firm

Signature of Authorized Person

Title

(SEAL)

Witness

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
1. Flashings and Counterflashings
 2. Miscellaneous Sheet Metal at all Roof Areas
 3. Accessories
- B. Related Sections:
1. Section 06100 – Miscellaneous Rough Carpentry
 2. Section 07532 – Thermoplastic Single-Ply Roofing
 3. Section 07900 – Joint Protection
- C. References:
1. ASTM International:
 - a. ASTM A 167 – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip
 - b. ASTM A 480/A480M – Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip
 - c. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - d. ASTM A 755/A 755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
 - e. ASTM A 792/A 792M – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
 - f. ASTM A 924/A 924M – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - g. ASTM B 29 – Standard Specification for Refined Lead.
 - h. ASTM B 32 - Standard Specification for Solder Metal.
 - i. ASTM B 209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - j. ASTM B 306 – Standard Specification for Copper Drainage Tube (DWV).
 - k. ASTM B 370 – Standard Specification for Copper Sheet and Strip for Building Construction.
 - l. ASTM B 749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
 - m. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 - n. ASTM D 1187 – Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
 - o. ASTM D 4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

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- p. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- 2. National Roofing Contractors' Association:
 - a. NRCA – National Roofing Contractors' Association Manual.
- 3. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
 - a. SMACNA - Architectural Sheet Metal Manual.

1.2 SUBMITTALS

- A. Section 01300 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Submit shop drawings for any condition not shown on plans and details.
- C. Product Data: Submit data on manufactured components metal types, finishes, and characteristics.
- D. Samples:
 - 1. Submit two samples 12 x 12 inch in size illustrating a typical external corner, internal corner, material and finish.
 - 2. Submit two samples 12 x 12 inch in size illustrating metal finish color.

1.3 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA and standard details and requirements.
- B. Failure to install work in strict accordance with provisions of this Section is subject to total rejection of the work specified herein.
- C. Maintain copy of documents on site.

1.4 MOCK-UPS

- A. Construct "in-place" sheet metal mock-ups demonstrating the following conditions as applicable and detailed in the project documents:
 - 1. Perimeter edge metal, splice and termination conditions.
 - 2. Edge metal exterior and interior corner conditions
 - 3. Gutter conditions: Attachment; expansion joint; splice; termination; downspout connections, etc.
 - 4. Typical interior wall counterflashing conditions.
 - 5. Parapet coping conditions and splice, etc.
 - 6. Roof expansion joint coping conditions:
 - 7. Additional conditions as may be determined by the Architect.
- B. Mock-ups are to be constructed and located where designated. Upon approval mock-ups may remain as part of the work.

SHEET METAL FLASHING AND TRIM SECTION 07620

1.5 QUALIFICATIONS

- A. Fabricator and Installer: Company specializing in sheet metal work with minimum three years documented experience.

1.6 PRE-INSTALLATION MEETINGS

- A. Section 01040 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Product storage and handling requirements.
- B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials causing discoloration or staining.

1.8 COORDINATION

- A. Section 01040 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate application of flashings with application of roofing, protruding material, and roof accessories to provide a complete weathertight installation according to the specified warranty requirements.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

- A. Stainless Steel: ASTM A 240, ASTM A 480 and ASTM A 666; Type 304, soft temper (annealed), 22 ga. or 24 ga. thickness unless otherwise specified; smooth 2B finish.
- B. Coated Aluminum Sheet Metal for Thermoplastic Roofs: Twenty (20) mil UV resistant PVC (polyvinyl chloride with Elvaloy®* KEE (ketone ethylene ester) membrane laminated to 0.040 thick 3003-H14 aluminum.
- C. Coated Stainless Steel Sheet Metal for Thermoplastic Roofs: Twenty (20) mil UV resistant PVC (polyvinyl chloride with Elvaloy®* KEE (ketone ethylene ester) membrane laminated to 22 ga. or 24 ga. thick stainless steel,
- D. Aluminum: ASTM B 209, alloy 3003, temper H14, AA-C22A41 mill finish; 0.040" thick; Cleats 0.050" thick.

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- E. Zinc-Coated Steel: (Galvanized) Commercial quality with 0.20% copper, ASTM A 525 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, 24 gage except as otherwise indicated.

2.2 ACCESSORIES

- A. Termination Bar: Aluminum ASTM B-209, Alloy 6061, Temper T-6, mill finish; sizes 1/8" thick by 1-1/2" with rounded edges.
- B. Sheet Metal Fasteners:
 - 1. Fasteners: Stainless steel
 - 2. Exposed fasteners are prohibited, and may only be used where specifically permitted by the project details or the Architect.
 - 3. Fasteners being on weather side of metal are to be a minimum #10 size "Scots" type screw with metal-backed neoprene washer integral with the head of the screw, or 3/16" diameter minimum steel rivet.
 - a. Locate and space fastenings for true vertical and horizontal alignment. Use proper type fastening tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
 - 4. Use stainless steel fasteners for exterior application and cadmium plated fasteners for interior applications. Use painted fasteners where fastening into painted panel or trim.
- C. Fasteners: Stainless steel: Fastener size and penetrations into various substrates should be as follows:
 - 1. Wood: ¼ inch screw x 2 inch penetration or 1 ½ inch annular ring stainless steel roofing nail.
 - 2. Concrete: ¼ inch "zamac" nail-in x 1 ½ inch penetration.
 - 3. Concrete Block: ¼ inch "zamac" nail-in x 1 ½ inch penetration.
- D. Fastener Schedule: Anchorage for below assumed to be into wood blocking, see details for other specifics.
 - 1. Continuous Cleats: 1 ½ inch annular ring stainless steel roofing nails at 6 inches on center maximum.
 - 2. See Fastener Schedule sheets included as part of the project documents.
 - 3. For all conditions not covered, refer to fastener specifications above or consult with Architect.
- E. Dry-in Membrane: Forty (40) mils thick, polyester reinforced, SBS modified asphalt waterproofing and underlayment membrane sheet.
 - 1. Interwrap Titanium PSU
 - 2. Protecto-Wrap "Rainproof-40"
 - 3. Soprema "Easltobond TU"
 - 4. Tamko "TW Metal and Tile" underlayment.
 - 5. W.R. Grace Ice & Water Shield
 - 6. Architect approved (prior to bidding) equivalent product.
- F. Primer: Asphaltic based primer for flanges set in adhesive.

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- G. Protective Backing Paint (bituminous coating): ASTM D1187, 'Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.'; SSPC-Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film – 15 mil dft) [Society for Protective Coatings].
- H. Sealant: Sealant specified in Section 07900.
- I. Plastic Cement: ASTM D 4586, Type I.
- J. Flashing Tape (concealed application): Double sided, gray extruded or preformed, 99% solids, cross linked polyisobutylene compound, non-sag, non-toxic, non-staining, permanently elastic self adhesive tape. One eighth (1/8) inch minimum thickness, 3/4" minimum width unless otherwise noted on the drawings.
 - 1. Pecora Corporation Extru-Seal Glazing Tape
 - 2. Tremco Construction Products 440 II Tape
 - 3. Equivalent products as approved by the Owner or Architect.
- K. Solder/Flux/Cleaner: ASTM B 32;
 - 1. Solder: type suitable for application and material being soldered. ASTM B-32; 50/50 lead/tin type or ASTM B-32: 90/10 tin/silver type
 - 2. Flux: Acid - Chloride type
 - 3. Flux Cleaner: Washing Soda Solution - 5% to 10%
- L. Sheet Metal Adhesive: Aluminum adhesive: SciGrip SG5000 Series adhesive, 2 component system as manufactured by SCIGRIP Americas, 600 Ellis Road, Durham, NC 27703. Contact: (887) 477-4583, (www.scigrip.com) or Architect approved equal.

2.3 FABRICATION

- A. Form sections shape indicated on Drawings, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet metal, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. At all metal roofing termination and transition assemblies / flashing which are to be fabricated using pre-finished metal per the project details; utilize the specified sheet metal adhesive in lieu of soldering or welding, unless noted otherwise by the details
- E. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- F. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- G. Fabricate corners from one piece with minimum 18 inch long legs; solder for rigidity, seal with sealant.

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- H. Prein edges of stainless steel sheet. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints. (Heliarc shop formed aluminum joints).
- I. Perform soldering work slowly, with properly heated irons to thoroughly heat seam material and sweat solder through full width of seam that shall show not less than 1 inch of evenly flowed solder.
 - 1. Start soldering immediately after application of flux.
 - 2. Solder flat locked seams.
- J. Fabricate vertical faces with bottom edge formed outward 1 inch and hemmed to form drip.
- K. Fabricate flashings to allow toe to extend 1 1/2" over wood nailers. Return and brake edges.
- L. At all fabrication of thermoplastic coated aluminum, remove coating from metal surfaces to be joined, bond metal surfaces and all joints using the specified epoxy adhesive per the manufacturer's recommendations.
- M. Heat weld the manufacturer approved thermoplastic flashing membrane over all joints in PVC coated metal flashing fabrications once epoxy adhesive has set.

2.4 FINISH

- A. Dissimilar Metal Isolation: Where applicable, back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mils when dissimilar metals are in contact.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01040 - Administrative Requirements: Coordination and project conditions.
- B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- C. Verify roofing termination and base flashings are in place, sealed, and secure.
- D. Do not proceed with work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.

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- B. Install surface mounted counterflashing and skirt metals to lines and levels indicated on Drawings. Seal top of counterflashing with sealant.
- C. Paint concealed metal surfaces with protective backing paint to minimum dry film thickness of 15 mils where applicable.

3.3 INSTALLATION

- A. Where applicable, insert flashings into receivers to form tight fit.
- B. Secure flashing in place using concealed fasteners. Use exposed fasteners only where permitted.
- C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Solder / weld per metal type metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.
- E. Apply modified bitumen cement compound between metal flashing and bituminous underlayment and/or flashing membrane. At other locations utilize self-adhesive butyl flashing tape as specified above.
- F. Seal metal joints watertight.

3.4 FIELD QUALITY CONTROL

- A. Division 1 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspection will involve surveillance of Work during installation to ascertain compliance with specified requirements.

3.5 SCHEDULE (Thermoplastic Roofing)

	<u>Location</u>	<u>Metal Type</u>	<u>Thickness</u>	<u>Finish</u>
A.	Counterflashings	Stainless	24 gage	Mill Finish
B.	C.F. Receivers	Stainless	24 gage	Mill Finish
C.	Skirt Metal	Stainless	24 gage	Mill Finish
D.	Coping Cap	Stainless	24 gage	Mill Finish
E.	Expansion Joint Hood	Stainless	24 gage	Mill Finish
F.	Edge Metal	Aluminum	0.040"	PVC Coated
G.	Cleats	Stainless	22 gage	Mill Finish

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- | | | | | |
|----|--|-----------|---------|-------------|
| H. | Scuppers | Aluminum | 0.040" | PVC Coated |
| I. | Scupper escutcheon | Stainless | 24 gage | Mill Finish |
| J. | Miscellaneous metal flashing and transitions: Stainless steel, mill finish, 24 gage, or Aluminum, PVC coated, 0.040" thickness as required by Architect. | | | |

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes sealants, joint backing and accessories.
- B. Related Sections:
 - 1. Section 07532 – Thermoplastic Single Ply Roofing
 - 2. Section 07620 – Sheet Metal Flashing and Trim

1.2 REFERENCES

- A. ASTM C 920 - Elastomeric Joint Sealants.
- B. ASTM C 1083 - Water Absorption of Cellular Elastomeric Gaskets and Sealants.
- C. ASTM D 1622 - Standard Test Method Apparent Density of Rigid Cellular Plastic.
- D. ASTM D 1623 - Standard Test Method for Apparent Tensile Adhesion Properties of Rigid Cellular Plastic.
- E. ASTM E 96 - Standard Test for Water Vapor Permeance.
- F. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.3 SUBMITTALS

- A. Division 1: Submittal procedures.
- B. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Samples: Submit two samples, 1/4 x 6 inch in size illustrating sealant colors for selection.
- D. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.
- E. Warranty: Include coverage for installed sealants and accessories failing to achieve watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

1.4 QUALITY ASSURANCE

- A. Perform work in strict accordance with sealant manufacturer's requirements for preparation of surfaces and material installations instructions.
- B. Maintain one copy of each document covering installation requirements on site.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years documented experience, and approved by manufacturer.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.
- B. Existing Conditions
 - 1. Verify existing conditions, such as soundness of perimeter conditions, and varying deck and wall thickness for length of anchoring services required and other visible conditions prior to Bidding.
 - 2. Report conflicts and problems to the Purchasing and Contracts Division for resolution prior to Bidding. Failure to report these conflicts and problems places the responsibility on the Contractor to complete the work in accordance with the Documents at no additional cost to the Owner.
 - 3. Replace or restore to original condition any materials or work damaged during construction.
 - 4. Surfaces not designated to receive the system shall be properly masked or otherwise protected against accidental spillage or application of the material to those areas.
 - 5. Failure to install the work in strict accordance with provisions of this Section, is subject to total rejection of work specified herein.

1.7 COORDINATION

- A. Coordination and project conditions provisions under Division 1.
- B. Coordinate Work with sections referencing this section.

1.8 WARRANTY

- A. Provide a **five (5) year** warranty under provisions of Section Division 1.

PART 2 PRODUCTS

2.1 JOINT SEALERS

- A. Manufacturers:
 - 1. Dow Corning Corp.
 - 2. GE Silicones
 - 3. Pecora Corp.

4. Sika Corp.
5. Tremco
6. Sonneborn
7. Substitutions: See Division 1 - Substitutions

B. Products Description:

1. Silicone Sealant (Type S): ASTM C 920, Grade NS, Class 25. Use single component, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, non sagging type; color as selected or match adjacent finish materials. Acceptable Manufacturers:
 - a. Dow Corning Product: 795
 - b. GE Product: Silpruf
 - c. Pecora Corporation Product: 860 / 863 / 864
 - d. Tremco Product: Spectrem II
 - e. Architect approved equal.
2. Polyurethane Sealant (Type S): ASTM C 920, Grade NS, Class 25. Use single component, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, non sagging type; color as selected or match adjacent finish materials. Acceptable Manufacturers:
 - a. Sika Product: 1A
 - b. Sonneborn Product: NP-1
 - c. Architect approved equal.
3. Ethicone Sealant (Type S): ASTM C 920, Grade NS, Class 25. Use single component, moisture curing, solvent free, non-staining, non-non bleeding, capable of continuous water immersion, non sagging type; color as selected or match adjacent finish materials. Acceptable Manufacturers:
 - a. ChemLink Product: M-1
 - b. Architect approved equal.

2.2 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Backer Rod of extruded polyolefin foam made of non-absorbing outer skin and a highly resilient interior network of open and closed cells which will not out-gas when ruptured. Oversize backer rod 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Coordination and project conditions provisions see Division 1.
- B. Verify substrate surfaces and joint openings are ready to receive work.
- C. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- A. Remove loose materials and foreign matter impairing adhesion of sealant.
- B. Clean and prime joints.
- C. Perform preparation in accordance with ASTM C1193.
- D. Protect elements surrounding Work of this section from damage or disfiguration.

3.3 INSTALLATION

- A. Perform installation in accordance with ASTM C1193 and manufacturer's instructions.
- B. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
 - 1. Width/depth ratio of 2: 1.
 - 2. Neck dimension no greater than 1/2 of joint width.
 - 3. Surface bond area on each side not less than 75 percent of joint width.
- C. Install bond breaker where joint backing is not used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Tool joints concave. channel shaped as detailed.

3.4 CLEANING

- A. Section 01700 - Closeout Requirements: Final cleaning.
- B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01700 - Closeout Requirements: Protecting installed construction.

B. Protect sealants until cured.

3.6 SCHEDULE (JOINT TYPES)

A.	Metal to Metal	Type: Silicone	Color to match metal
B.	Metal to PVC Roof Membrane	Type: Urethane	Color to match membrane
C.	Metal to Bitumen Materials	Type: Ethicone	Color to match membrane
D.	CMU / Stucco Joints	Type: Polyurethane	Color to match Paint
E.	Bitumen membrane to CMU	Type: Ethicone	Color to match membrane
F.	PVC membrane to CMU	Type: Polyurethane	Color to match membrane

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Domed plastic unit skylights

- B. Related Sections:
 - 1. Section 06100 – Miscellaneous Rough Carpentry.
 - 2. Section 07532 – Thermoplastic Single Ply Roofing
 - 3. Section 07620 – Sheet Metal Flashing and Trim
 - 4. Section 07900 – Joint Sealers

1.2 REFERENCES

- A. AA (Aluminum Association)
 - 1. AA - M12C22A41- Anodized Plus Finish
 - 2. AA - M12C22A32/A34 - Aluminum Association (AA) - Color anodized: Class II, Color Anodic Finish

- B. AAMA (American Architectural Manufacturer's Association)
 - 1. AAMA - 501.2) - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
 - 2. AAMA - 605.2 - Voluntary Specification for High Performance Organic Coatings.
 - 3. AAMA - 607.1 - Voluntary Guide Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
 - 4. AAMA - 612 - Voluntary Specifications and Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Coatings on Architectural Aluminum, for Finishes such as Anodized Plus.

- C. ASTM
 - 1. ASTM – B 209 - American Society for Testing and Materials (ASTM) - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. ASTM – C 1048 - American Society for Testing and Materials (ASTM) - Standard Specification for Heat-Treated Flat Glass Kind HS, Kind FT Coated and Uncoated Glass.
 - 3. ASTM – E 331 - American Society for Testing and Materials (ASTM) - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 4. ASTM – E 773 - American Society for Testing and Materials (ASTM) - Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units.
 - 5. ASTM - E774 American Society for Testing and Materials (ASTM) - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Indicate materials, finishes and installation procedures recommended by manufacturer.
 - 4. Indicate compliance with specified design criteria.
 - 5. Indicate compliance with performance requirements.
 - 6. Include product specific glazing details.
- C. Shop Drawings:
 - 1. Indicate material types, gauges and finishes, fabrication details and installation details.
 - 2. Show glazing types, methods of attachment and thermal movement provisions.
- D. Indicate compliance with specified structural design criteria.
 - 1. Submitted design calculations shall bear seal of a professional engineer licensed in the State in which the skylight is to be installed.
 - 2. Certify that engineer has reviewed shop drawings.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- G. Manufacturer's Field Reports: [Required] [Not required].

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Skylight manufacturer shall have a minimum of ten years experience in design, fabrication and installation of custom aluminum skylight systems.
- B. Installer Qualifications:
 - 1. Installer shall be trained and approved by manufacturer.
 - 2. Installer shall have five years of experience with skylight type, size and complexity.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

- A. Performance Warranty: Provide manufacturer's five (5) year written warranty covering skylight work. Warranty shall cover defective materials, workmanship and performance. Warranty shall be limited to repair or replacement of work described in this section and shall not provide for repair or replacement of work by others.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: (Basis of Design) American Skylites, Inc., which is located at: 525 113th St.; Arlington, TX 76011; Toll Free Tel: 800-772-7401; Tel: 817-633-4666; www.americanskylites.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600

2.2 SKYLIGHT PERFORMANCE

- A. Load:
 - 1. Deflection of framing members shall not exceed L/180 or 1 inch (25 mm) whichever is less.
 - 2. Acrylic and/or polycarbonate unit skylights shall meet the requirements of uniform load test ASTM E330 that requires glazing to withstand a positive and negative test pressure of 60 psf.
- B. Air Infiltration:
 - 1. Acrylic and/or polycarbonate unit skylights shall meet the requirements of ASTM E283 that allows a maximum air infiltration of 0.06 cfm (.0017 cu. m/m) of the total glazed surface area.
- C. Water Infiltration:

1. Acrylic and/or polycarbonate unit skylights shall meet the requirements of ASTM E547/E331 that allows for no water infiltration at a test pressure of 12 psf (571 Pa).

2.3 PLASTIC SKYLIGHT

- A. Curb Mount: Double domed polycarbonate non-thermally broken curb mount skylight unit.
 1. Nominal Size: Field verify exact dimensions required
 2. Glazing Material:
 - a. Outer Dome: Polycarbonate
 - b. Inner Dome: Polycarbonate
 3. Glazing Color:
 - a. Outer Dome: Clear
 - b. Inner Dome: Clear
 4. Frame Finish: Clear anodized aluminum

2.4 FABRICATION

- A. Unit Frame: Extruded aluminum reinforced and welded corner joints, integral curb from mounting flange to receive roof flashing system, with integral condensation gutter and dome retainer. Condensation drainage shall be to the exterior.
- B. Glazing Gaskets and Sealants: Glazing to be separated from frame by a continuous extruded black santoprene gasket.
- C. Fasteners: Screws and fasteners used in the factory assembly process shall be stainless steel. Fasteners and screws used for securing skylight to structure shall be stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
 1. Prior to any work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 2. Verify that flashing and sheet metal may be installed in accordance with the original design, approved mock-ups and standards.
- B. Immediately notify the Architect of any defects. Do not install metal work until defects have been corrected.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Metal Protection (Aluminum):
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
 - 3. Where aluminum will contact pressure-treated wood, separate dissimilar materials by methods recommended by manufacturer.

3.3 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing skylight components.
- B. Coordinate with installation of roof deck and other substrates to receive skylight units.
- C. Coordinate with installation of vapor barriers, roof insulation, roofing, and flashing as required to assure that each element of the work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

3.4 CLEANING

- A. Remove protective material from prefinished aluminum surfaces.
- B. Wash down exposed surfaces; wipe surfaces clean.
- C. Remove excess sealant.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PORTLAND CEMENT STUCCO ALTERATIONS AND REPAIRS

SECTION 09221

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Portland cement plaster (stucco) on metal lath (three coat application)
 - 2. Trim
- B. Related Sections:
 - 1. Section 07620 – Sheet Metal Flashing and Trim
 - 2. Section 07900 – Joint Sealers
 - 3. Section 09900 – Minor Painting

1.2 REFERENCES

- A. American Society for Testing and Materials International (ASTM)
 - 1. ASTM C 150 - Standard Specification for Portland Cement.
 - 2. ASTM C 206 - Standard Specification for Finishing Hydrated Lime.
 - 3. ASTM C 847 - Standard Specification for Metal Lath.
 - 4. ASTM C 897 - Standard Specification for Aggregates for Job-Mixed Portland Cement-Based Plasters.
 - 5. ASTM C 926 - Standard Practice for Application of Portland Cement-Based Plaster.
 - 6. ASTM C 932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
 - 7. ASTM C 1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
 - 8. ASTM C 1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
- B. National Association of Architectural Metal Manufacturers (NAAMM)
 - 1. ML/SFA 920 - Guide Specifications for Metal Lathing and Furring.

1.3 DESCRIPTION OF WORK

- A. Work in the section includes the exterior wall surfaces of the OCCC West Building Roof Repairs in areas where stucco removal has occurred due to flashing modifications and installation.
- B. Remove loose stucco back to solidly adhered stucco surfaces. Make joining flush, smooth, and uniform, without visible lap marks. Match stucco texture to adjacent surfaces.
- C. Follow requirements of this section for appropriate installation procedures.

**PORTLAND CEMENT STUCCO ALTERATIONS AND REPAIRS
SECTION 09221**

1.4 SUBMITTALS

- A. Submit in accordance with Division 01 – Submittal Procedures.
- B. Product Data: Manufacturer's product information
- C. Samples: Not required.
- D. Manufacturer's Installation Instructions: Required.
- E. Manufacturer's Certificate: Manufacturer's certification that materials conform to specification requirements.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Minimum five (5) years documented experience in work of this Section.
- B. Mockup:
 - 1. Size: 100 square feet.
 - 2. Show: Stucco color and texture, horizontal and vertical control joints, and casings.
 - 3. Locate where directed.
 - 4. Approved mockup may remain as part of the Work

1.6 JOB CONDITIONS

- A. Existing Conditions:
 - 1. Verify existing conditions, such as soundness of perimeter conditions, and varying wall thickness for length of anchoring devices required and other visible conditions prior to Bidding.
 - 2. Report conflicts and problems to OC Purchasing for resolution prior to Bidding. Failure to report these conflicts and problems places the responsibility on the Contractor to complete the work in accordance with the Documents at no additional cost to the Owner.
- B. Protection Requirements:
 - 1. Replace or restore to original condition any materials or work damaged during construction.
 - 2. Surfaces not designated to receive work of this section shall be properly masked or otherwise protected against accidental damage or application of the material to those areas.
- C. Cold Weather Application Requirements:
 - 1. Do not apply stucco unless minimum ambient temperature is above 50 degrees F for 48 hours prior to, during, and after application and during curing period
- D. Hot Weather Application Requirements:

PORTLAND CEMENT STUCCO ALTERATIONS AND REPAIRS SECTION 09221

1. At ambient temperature above 85 degrees F, relative humidity less than 75 percent, or winds in excess of 20 MPH, "mist" surface with water and cover with minimum 6 mil polyethylene film weighted or taped in place.
 2. Leave coverings in place minimum 48 hours after application.
- E. Failure to install the work in strict accordance with provisions of this Section is subject to total rejection of work specified herein.

1.7 PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this section
1. Prior to work of this Section, meet at project site with Contractor and representatives of other entities directly concerned with performance work. Coordinate so representatives of governing authorities, product manufacturers, Architect and Owner will also be present.
 2. Review requirements, Contract Documents, submittals, status of coordinating work, availability of materials and installation facilities, proposed installation schedule, requirements for inspections and testing or certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures.
 3. Record discussion on matters of significance; furnish copy of recorded discussions to each participant. Discuss wall system protection requirements for construction period extending beyond installation.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver to site, store, protect and handle products under the following provisions.
1. Store materials on raised platforms above ground.
 2. Store and handle materials to protect them from:
 - a. Moisture, whether due to precipitation or condensation.
 - b. Damage by construction traffic.
 - c. Mud, dust, sand, oil, grease and dirt.
 3. Store materials according to manufacturer's printed instructions.
- B. Handling:
1. Select and operate material handling equipment and store materials to keep from damaging existing construction.
 2. Comply with fire, safety, and environmental protection regulations.

1.9 COORDINATION

- A. Coordinate Work in accordance with Owner's requirements.

**PORTLAND CEMENT STUCCO ALTERATIONS AND REPAIRS
SECTION 09221**

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers – Metal Lath and Trim:
1. AMICO Building Products –
1033 Pine Chase Avenue
Lakeland, FL 33801
 2. CEMCO – California Expanded Metal Products
 3. SEMCO Southeastern Metals
11801 Industry Drive
Jacksonville, FL
 4. Clark Dietrich Building Systems
9100 Centre Pointe Drive, Suite 210
West Chester, OH 45069
 5. Substitutions may be submitted for consideration under provisions of Division 01 – Product Requirements.
- B. Acceptable Manufacturers – Stucco (Plaster) Materials:
1. Argos USA
Tampa, FL
<http://www.argos-us.com/>
 2. QUICKCRETE® Companies
One Securities Center
3490 Piedmont Road, NE Suite 1300
Atlanta, GA 30305
 3. Parex USA, Inc.
4125 E. La Palma Ave., Suite 250
Anaheim, CA 92807
Contact: Architectural Sales (866.516.0061) or Technical Support (800.226.2424).
<http://www.parexusa.com>
 4. Substitutions may be submitted for consideration under provisions of Division 01 – Product Requirements.

2.2 STUCCO MATERIALS AND ACCESSORIES

- A. Portland Cement Plaster (Stucco): Florida Super Stucco manufactured by Argos USA, Tampa, Florida or an Architect approved manufactured brand conforming to: ASTM C 926; ASTM C 91, Type S.
1. All But Finish Coat: Florida Fibered Stucco with ½ pound of reinforcing fibers added to each stucco batch during the mixing process.
 2. Finish Coat: Florida Super Stucco.
- B. Portland Cement: ASTM C 150, from one source.
- C. Hydrated lime: ASTM C 206, Type S.

PORTLAND CEMENT STUCCO ALTERATIONS AND REPAIRS
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- D. Reinforcing fibers for plaster mixes: Hi-Tech Stucco Fibers manufactured by Hi-Tech Fibers, Edgefield, S.C.
- E. Bonding agent:
 - 1. Acrylbond by Lambert Corporation, Orlando, Florida.
 - 2. Cement-Stucco Bond by Dana Marine Laboratory, Tampa, Florida
 - 3. Acrylic Admix 101 by Larsen Products Corp., Rockville, MD.
 - 4. Acryl 60 by Thoro, Miami, FL
- F. Water: Potable, clean, and free from substances harmful to plaster.
- G. Sand for Portland cement plaster: ASTM C 897-05(2009)
- H. Sealant: As specified in Section 07900.

2.3 LATH AND TRIM

- A. Lath description: Self-furring 3.4 pound diamond mesh lath, dimpled 1 1/2" on center each way, galvanized.
- B. Trim Accessories: (Plastic Components, Inc)
 - 1. Material: Extruded PVC, perforated flanges.
 - 2. Casing beads: Thickness governed by plaster thickness, square edge.
 - 3. J Beads: 3.5" wide nailing flange with weep holes
 - 4. Stucco Reveal: match existing profile
 - 5. Expansion/Control Joints: Accordion profile with minimum 2 inch flanges each side
- C. Metal Lath Fasteners (Each type as approved by Architect)
 - 1. Steel Stud Application:
 - a. Galvanized steel furring nails and or screws, of type and length suitable for at least a 2/3 inch (17 mm) penetration of the steel stud system

PART 3 EXECUTION

3.1 WORKMANSHIP/INSTALLATION-STUCCO

- A. Provide best workmanship available in accordance with best practices of trade.
- B. Follow requirements of this section for appropriate installation procedures.
- C. Lay-out stucco work so that stoppages occur only at natural breaks such as expansion or control joints, corners, and other metal trim conditions.
 - 1. Make joinings flush, smooth and uniform, without visible lap marks.

**PORTLAND CEMENT STUCCO ALTERATIONS AND REPAIRS
SECTION 09221**

- D. Cracks in bonded substrate larger than what is considered “hairline” shall have sealant applied in accordance with Section 07900. The scope of work shall provide for the repair of stucco areas greater than 2.5 sq. feet.
- E. Remove loose stucco back to solidly adhered stucco surface. Use 3/8” x 8” rebar to make soundings to determine location of hollow/non-adhered areas.
 - 1. Make joinings flush, smooth and uniform, without visible lap marks.
- F. Do not apply stucco when temperature is above 95 degrees F., or below 45 degrees F. Temperature may be as high as 95 degrees F. during curing.
- G. Maintain stucco surface planes within allowable tolerances;
 - 1. Allowable tolerances: Finish all stucco surfaces to true and even plane within tolerance of 1/8 in. in 5 ft. - 0 in. as measured by a straight edge placed at any location on surface.

3.2 INSPECTION

- A. The Contractor shall inspect stucco surfaces to determine the extent of repair required. Soundings are to be made using 3/8” rebar to locate areas of loose (hollow/non-adhering) or otherwise damaged or deteriorated stucco conditions.
- B. Verify that surfaces to receive stucco are free of dust, loose particles, oil, and foreign matter which would affect bond of subsequent stucco coats.
- C. Examine framing, grounds, and accessories to insure that finished stucco surfaces will be true to line, level and plumb, without requiring additional thicknesses of stucco and with clearance behind metal lath to permit keying.
- D. Cracks in bonded substrate larger than what is considered “hairline” shall have sealant applied in accordance with the requirements of Section 07900 – Joint Sealants.
- E. Remove loose stucco back to solidly adhered stucco surfaces. Make joinings flush, smooth and uniform, without visible lap marks. Match stucco texture to adjacent surfaces.
- F.

3.3 PROTECTION

- A. Cover, or otherwise protect finish materials subject to damage by stucco.
- B. Cover and protect adjacent areas from stucco stains, including areas which will be covered by other finish materials.

PORTLAND CEMENT STUCCO ALTERATIONS AND REPAIRS

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3.4 MEASURING AND MIXING

- A. Measuring: Proportion and measure ingredients in suitably calibrated devices which can be easily and accurately checked at any time. Shovel measurements are not permitted.
1. Scratch and Brown Coat:
 - a. ASTM C926, Type C. Add reinforcing fibers at a rate of ½ pound per sack of cement.
 - b. One 78 pound bag of stucco with fibers mixed in, 2-1/4 to 3-1/4 parts by volume sand. (Mix in accordance with manufacturer's instructions)
 2. Finish Coat:
 - a. ASTM C926.
 - b. One 78 pound bag of Super Stucco and 2-1/4 to 3 parts by volume sand, fine texture. (Mix in accordance with manufacturer's instructions)
- B. Mixing:
1. Use mechanical mixer.
 2. Mix each batch separately; double batching with single batch discharge not acceptable.
 3. Accurately proportion materials for initial mixture using measuring devices of known volume. Sand may be added by shovel after mixer is calibrated with known volumes of materials, including water.
 4. Thoroughly mix materials dry before adding water. Continue mixing for 3 to 5 minutes after all ingredients have been added.
 5. Clean equipment after each batch.
 6. Mixtures may be re-tempered one time after initial mixing.
 7. Discard frozen, caked, and hardened mixes. Discard mixes not used within 1-1/2 hours after initial mixing
 8. Bonding Agent: Approved bonding agent shall be added, diluted 50/50 with water. Follow Architect approved manufacturer's, volume/bag, recommendation of bonding agent.
 9. If reinforcing fibers are not already contained in cement stucco bags, add reinforcing fibers to mixer by hand sprinkling, for complete dispersion throughout mix, during last minutes of mixing cycle. Add fibers for both scratch coat and brown coat mixes.
 - a. Follow manufacturer's recommendations.

3.5 APPLICATION OF STUCCO

- A. Apply stucco in accordance with ASTM C 926.
- B. Apply scratch, brown, and finish coats to minimum 7/8 inch thickness from face of lath.
- C. Dampen each coat prior to applying succeeding coats.
- D. Three Coat Application on Metal Lath (Scratch, Brown and Finish Coats). Minimum 7/8 inch thickness from face of lath.
 1. Scratch Coat:

PORTLAND CEMENT STUCCO ALTERATIONS AND REPAIRS

SECTION 09221

- a. Apply to nominal 3/8 inch thickness.
 - b. Form full keys on lath. Cross rake surface to bond brown coat.
 2. Brown Coat:
 - a. Apply to nominal 3/8 inch thickness.
 - b. Bring out to grounds and rod level.
 - c. Float surface to provide surface texture receptive to application of finish coat.
 3. Finish Coat:
 - a. Apply to nominal 1/8 inch thickness.
 - b. Work from wet edges to apply unbroken area in one continuous operation to eliminate joints.
 - c. Finish surfaces to match color and texture of adjacent surfaces.
 - d. Finish surfaces true to plane, plumb and with neat, sharp corners and intersections.
 - e. Work in panels to nearest natural break formed by intersections, corners, trim, and accessories.
 - f. Tool plaster to V-joint at trim, grounds and accessories.
 - g. Not acceptable: Lines caused by variations in application or finishing techniques, cold joints, and other surface defects visible when viewed from a distance of 10 feet.
- E. Finish Texture: to match existing.
- F. Total Plaster Thicknesses:
 1. Seven eights (7/8) inch over metal lath, or as required matching existing at areas of patching of existing.

3.6 CURING STUCCO

- A. Moist cure scratch coat for 48 hours. Wet or "mist" surfaces as climatic conditions require. Warm dry conditions require more moisture. Cold rainy conditions require less.
- B. Moist cure brown coat for 48 hours; Dry cure brown coat (allow to "sit") for 5 days. Total wet and dry curing time equals 7 days.
- C. Dry cure finish coat approximately 14 days.

3.7 PATCHING AND COMPLETION

- A. Complete entire work to the satisfaction of the Owner and Architect.
- B. Neatly patch or replace damaged stucco surfaces after the various trades have left the work.
- C. Remove broken or damaged stucco. Patch with same materials and methods as original work. Match adjoining work in plane, finish and texture, without perceptible joints.

PORTLAND CEMENT STUCCO ALTERATIONS AND REPAIRS
SECTION 09221

- D. Upon completion of work, remove excess plaster from beads, screeds, base, trim, and adjoining work, and leave work clean.

3.8 PROTECTION

- A. Provide final protection and maintain conditions, in manner suitable to Owner that ensures plaster work being without damage or deterioration at time of Substantial Completion.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Surface preparation and field application of paints for use in touching up existing surfaces.
 - 2. Surface preparation and field application of paint to new and existing metal fabrications, such as ladders, stairs, support stands, etc.
- B. Related Sections:
 - 1. Section 06100 – Miscellaneous Rough Carpentry
 - 2. Section 07620 – Sheet Metal Flashing and Trim
 - 3. Section 07900 – Joint Sealers
 - 3. Section 09221 – Portland Cement Stucco Alterations and Repairs

1.2 REFERENCES

- A. ASTM D 16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products
- B. PDCA (Painting and Decorating Contractors of America) - Painting - Architectural Specifications Manual
- C. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual

1.3 DEFINITIONS

- A. Conform to ASTM D 16 for interpretation of terms used in this Section.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1
- B. Product Data: Provide data on all finishing products
- C. Samples: Submit manufacturer's color chart illustrating range of colors available for each surface finishing product scheduled
- D. Manufacturer's Installation Instructions: Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years experience.

- B. Applicator: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to code for flame and smoke rating requirements for finishes.

1.7 MOCK-UP (FIELD SAMPLES)

- A. Provide field sample of paint under provisions of Division 1.
- B. If required, provide field sample panel, fascia edge metal, illustrating special coating color, texture, and finish. Locate where directed.
- C. Accepted samples may remain as part of the Work.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver to site, store, protect and handle products under provisions of Division 1.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 PROJECT CONDITIONS

- A. Existing Conditions
 1. The Bidder shall verify existing conditions prior to Bidding.
 2. Conflicts and problems shall be reported to the Architect for resolution prior to Bidding. Failure to report these conflicts and problems places the responsibility on the Prime Contractor to complete the work in accordance with the Documents at no additional cost to the Owner.
 3. Replace or restore to original condition any materials or work damaged during construction.
 4. Surfaces not designated to receive the system shall be properly masked or otherwise protected against accidental spillage or application of the material to those areas.
 5. Failure to install the work in strict accordance with provisions of this Section, is subject to total rejection of work specified herein.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Do not apply exterior coatings during rain or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- C. Minimum Application Temperatures for paints and coatings: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

1.11 EXTRA MATERIALS

- A. Provide 1 gallon of each color and type to Owner.
- B. Label each container with color, type, texture, locations, in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 PAINTING PRODUCTS

- A. Manufacturers: Paints
 - 1. Benjamin Moore
 - 2. Devoe and Reynolds
 - 3. Duron Inc.
 - 4. The Glidden Co.
 - 5. MAB Paints
 - 6. PPG Industries
 - 7. Porter Paint
 - 8. Pratt & Lambert
 - 9. Sherwin-Williams
- B. Manufacturers: Primers
 - 1. Manufacturer's specified primer for use with metals, stucco, wood and other building materials.
- C. Manufacturers: Rust Treatment Products:
 - 1. Skybrite Company – “Ospho” Rust Inhibitive Coating
 - 2. Orison Marketing, L.L.C – “Evapo-Rust” Rust Remover
 - 3. Substitutions are permitted upon approval
- D. Substitutions: Under provisions of Section Division 1

2.2 MATERIAL REQUIREMENTS

- A. Paint and Coatings: Ready mixed, lead free, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.
- B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.3 FINISHES

- A. Refer to schedule at end of section for surface finish schedule.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions under provisions of Division 1
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

- A. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Correct defects and clean surfaces which affect work of this section.
- C. Seal marks or stains with shellac which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Stainless Steel Surfaces: Remove foreign matter. Brush with stiff fiber brushes using appropriate cleaning solutions followed by rinsing with fresh water. Remove dirt, dust and other contaminants from the surface prior to paint application by means of brushing, blow off with clean, dry air, or vacuum cleaning.

**MINOR PAINTING
SECTION 09900**

- F. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints are cleaned. Prime and paint after repairs.
- G. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime metal items including shop primed items.
- H. Rust Treatment of Sheet Steel Surfaces (Metal Decking): Sand and scrape to remove grease, scale, dirt and rust. Prepare surface as required by rust treatment manufacturer. Apply treatment to surfaces. Let stand overnight. Apply paint system.
- I. Plaster/Stucco Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- J. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defected areas after repair.
- K. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- L. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- M. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior paintable caulking compound after prime coat has been applied.
- N. Wood Doors Scheduled for Painting: Seal wood door top and bottom edge surfaces with clear or tinted sealer.
- O. Metal Doors Scheduled for Painting: Prime metal door top and bottom edge surfaces.

3.3 EXTENT OF WORK

- A. Small areas requiring paint and coating application shall extend over entire plane of adjacent surface areas. Verify extent with Architect and Owner prior to bidding.

3.4 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry.

- C. Apply each coat to uniform finish. Apply each coat slightly darker than preceding coat unless otherwise approved.
- D. Allow each coat to dry before applying next coat. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

3.5 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Division 1.

3.6 CLEANING

- A. Clean work under provisions of Division 1.
- B. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.7 SCHEDULES

- A. Steel – Stainless: (Water Based – Acrylic System)
 - 1. One coat primer
 - 2. Two coats high performance acrylic , semi-gloss
- B. Exterior Masonry Scupper In-Fill
 - 1. One Coat of masonry primer.
 - 2. Two coats of acrylic masonry paint. Color to match existing wall
- C. Exterior Plaster (Stucco):
 - 1. One Coat of masonry primer.
 - 2. Two coats of acrylic masonry paint. Color to match existing wall.
- D. Exterior Metal finishes:
 - 1. One coat of metal primer.
 - 2. Two coats of a acrylic metal paint. Color to match existing parapet wall counterflashing.
- E. Wood - Painted (Opaque)
 - 1. One coat of latex primer sealer.
 - 2. Two coats of latex enamel. Sheen to match existing.
- F. Steel – Unprimed:
 - 1. One coat of alkyd primer
 - 2. Two coats of alkyd enamel, [gloss.] [semigloss.]
- G. Steel - Shop Primed
 - 1. Touch-up with zinc chromate primer.
 - 2. Two coats of alkyd enamel, [gloss.] [semi gloss.]

- H. Rust Treatment to Metal Surfaces
 - 1. Apply 1-2 coats of treatment (according to severity of rust)
 - 2. Let stand overnight. Apply paint system

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Piping materials and installation instructions common to most piping systems.
 2. Sleeves.
 3. Grout.
 4. Equipment installation requirements common to equipment sections.
 5. Supports and anchorages.

1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 GENERAL REQUIREMENTS

- A. Carefully examine General Conditions, other specification sections, and other drawings (in addition to DIVISION 15), in order to be fully acquainted with their effect on plumbing work. Additions to the contract cost will not be allowed due to failure to inspect existing conditions.
- B. Do all work in compliance with 2014 Florida Building Code, and the Codes adopted therein, 2015 Florida Fire Prevention Code 5th Edition. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like, and deliver such certificates to the Architect/Engineer.
- C. Cooperate and coordinate with all other trades. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the condition of the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by plumbing workmen.

**COMMON WORK RESULTS FOR PLUMBING
SECTION 15010**

- D. Furnish, perform, or otherwise provide all labor (including, but not limited to, all planning, purchasing, transporting, rigging, hoisting, storing, installing, testing, chasing, channeling, cutting, trenching, excavating and backfilling), coordination, field verification, equipment installation, support, and safety, supplies, and materials necessary for the correct installation of complete and functional plumbing systems (as described or implied by these specifications and the applicable drawings).

1.4 DRAWINGS:

- A. Indicate only diagrammatically the extent, general character, and approximate location of work. Where work is indicated, but with minor details omitted, furnish and install it complete and so as to perform its intended functions.
- B. DIVISION 15 work called for under any section of the project specifications, shall be considered as included in this work unless specifically excluded by inclusion in some other branch of the work. This shall include roughing-in for connections and equipment as called for or inferred. This would include cold water, hot water, sanitary and storm connections required for all water closets, urinals, lavatories, showers, sinks, water coolers, bubblers, water heaters, boilers, hose bibs, hydrants, roof drains, area drains, refrigerators, dishwashers, mechanical condensate, etc as required for a functional installation, whether shown on the drawings or not. Check all drawings and specifications for the project and shall be responsible for the installation of all DIVISION 15 work.
- C. Take finish dimensions at the job site in preference to scale dimensions. Do not scale drawings where specific details and dimensions for DIVISION 15 work are not shown on the drawings, take measurements and make layouts as required for the proper installation of the work and coordination with all drawings and coordination with all other work on the project. In case of any discrepancies between the drawings and the specifications that have not been clarified by addendum prior to bidding, it shall be assumed by the signing of the contract that the higher cost (if any difference in costs) is included in the contract price, and perform the work in accordance with the drawings or with the specifications, as determined and approved by the Architect/ Engineer, and no additional costs shall be allowed to the base contract price.
- D. Carefully check the drawings and specifications of all trades and divisions before installing any of the work. Contractor shall in all cases consider the work of all other trades, and shall coordinate his work with them so that the best arrangements of all equipment, piping, conduit, ducts, rough-in, etc., can be obtained. The avoidance of any beams, joist or bracing that is an obstruction to piping, shall be included in the bid. This includes the reroute of piping or dimension revisions required to obtain the intended function of the plumbing work. No cost will be paid by the owner for these modifications that can be identified by reviewing all sets of drawings prior to bid.
- E. Obtain manufacturer's data on all equipment, the dimensions of which may affect plumbing work. Use this data to coordinate proper service connections, entry locations, etc., and to ensure minimum clearances are maintained.

**COMMON WORK RESULTS FOR PLUMBING
SECTION 15010**

1.5 QUALIFICATIONS OF CONTRACTOR:

- A. Contractor performing any part of this scope of work shall be a Florida State Certified Plumbing Contractor (Type CFC)
- B. Provide field superintendent who has had a minimum of four (4) years previous successful experience on projects of comparable size and complexity. Superintendent shall be on the site at all times during construction.

1.6 SITE VISIT/CONDITIONS

- A. Visit the site of this contract and thoroughly familiarize with all existing field conditions and the proposed work as described or implied by the contract documents. During the course of this site visit, verify every aspect of the proposed work and the existing field conditions in the areas of construction which might affect this work. No compensation or reimbursement for additional expenses incurred due to failure or neglect to make a thorough investigation of the contract documents and the existing site conditions will be permitted.
- B. Install all equipment so that all Code required and Manufacturer required or recommended servicing clearances are maintained. Coordinate the proper arrangement and installation of all equipment within any designated space. If it is determined that a departure from the Contract Documents is necessary, submit to the A/E, for approval, detailed drawings of the proposed changes prior to bid.
- C. Submission of a proposal will be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered will not be recognized.
- D. Existing conditions and utilities indicated are taken from existing construction documents, surveys, and field investigations. Unforeseen conditions probably exist and existing conditions shown on drawings may differ from the actual existing installation with the result being that new work may not be field located exactly as shown on the drawings. Field verify dimensions of all site conditions prior to bidding and include any deviations in the contract. Notify A/E if deviations are found.
- E. All existing plumbing is not shown. Become familiar with all existing conditions prior to bidding, and include in the bid the removal of all plumbing fixtures, equipment and piping etc. that is not being reused, back to its originating point.
- F. Locate all existing utilities and protect them from damage. Pay for repair or replacement of utilities or other property damaged by operations in conjunction with the completion of this work.
- G. Work is in connection with existing buildings which must remain in operation while work is being performed. Work shall be in accord with the schedule required by the Contract. Schedule work for a minimum shut down to Owner. Notify Owner 72 hours in advance of any shut-down of existing systems. Perform work during non-operating hours unless otherwise accepted by Owner. Protect existing buildings and equipment during construction.

**COMMON WORK RESULTS FOR PLUMBING
SECTION 15010**

1.7 SUBMITTALS

- A. Welding certificates.

1.8 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.3 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

**COMMON WORK RESULTS FOR PLUMBING
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- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.

2.4 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.

- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- M. Verify final equipment locations for roughing-in.
- N. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- O. All plumbing equipment are subject to the requirements of specification section 01 8111 Sustainable Construction Requirements.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Nonpressure Piping: Join according to ASTM D 2855.
 - 3. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- E. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.

**COMMON WORK RESULTS FOR PLUMBING
SECTION 15010**

- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION

**COMMON WORK RESULTS FOR MECHANICAL
SECTION 15050**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Mechanical equipment coordination and installation.
 - 2. Common mechanical installation requirements.
 - 3. Commissioning requirements.

1.3 GENERAL REQUIREMENTS

- A. Carefully examine General Conditions, other specification sections, and other drawings (in addition to DIVISION 15), in order to be fully acquainted with their effect on mechanical work. Additions to the contract cost will not be allowed due to failure to inspect existing conditions.
- B. Do all work in compliance with 2010 Florida Building Code, and the Codes adopted therein, 2010 Florida Fire Prevention Code. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like, and deliver such certificates to the Architect/Engineer.
- C. Cooperate and coordinate with all other trades. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the condition of the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by mechanical workmen.
- D. Furnish, perform, or otherwise provide all labor (including, but not limited to, all planning, purchasing, transporting, rigging, hoisting, storing, installing, testing, chasing, channeling, cutting, trenching, excavating and backfilling), coordination, field verification, equipment installation, support, and safety, supplies, and materials necessary for the correct installation of complete and functional mechanical systems (as described or implied by these specifications and the applicable drawings).

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1.4 DRAWINGS:

- A. Indicate only diagrammatically the extent, general character, and approximate location of work. Where work is indicated, but with minor details omitted, furnish and install it complete and so as to perform its intended functions.
- B. DIVISION 15 work called for under any section of the project specifications, shall be considered as included in this work unless specifically excluded by inclusion in some other branch of the work. This shall include roughing-in for connections and equipment as called for or inferred. This would include connection and ductwork required for all fans, hoods, dryers, diffusers etc as required for a functional installation, whether shown on the drawings or not. Check all drawings and specifications for the project and shall be responsible for the installation of all DIVISION 15 work.
- C. Take finish dimensions at the job site in preference to scale dimensions. Do not scale drawings where specific details and dimensions for DIVISION 15 work are not shown on the drawings, take measurements and make layouts as required for the proper installation of the work and coordination with all drawings and coordination with all other work on the project. In case of any discrepancies between the drawings and the specifications that have not been clarified by addendum prior to bidding, it shall be assumed by the signing of the contract that the higher cost (if any difference in costs) is included in the contract price, and perform the work in accordance with the drawings or with the specifications, as determined and approved by the Architect/ Engineer, and no additional costs shall be allowed to the base contract price.
- D. Carefully check the drawings and specifications of all trades and divisions before installing any of the work. Contractor shall in all cases consider the work of all other trades, and shall coordinate his work with them so that the best arrangements of all equipment, piping, conduit, ducts, rough-in, etc., can be obtained. The avoidance of any beams, joist or bracing that is an obstruction to ductwork, shall be included in the bid. This includes the reroute of ductwork or dimension revisions required to obtain the intended function of the ductwork. Bring all obstructions to the attention of the A/E during the shop drawing preparation and prior to fabrication of any ductwork. No cost will be paid by the owner for these modifications that can be identified by reviewing all sets of drawings prior to bid.
- E. Provide appropriately rated fire dampers or fire/smoke dampers as required by code at penetrations of fire rated or smoke rated walls by all duct work including but not limited to air supply, return, exhaust and ventilation ducts. These shall be provided at no additional cost whether shown on the drawings or not.
- F. Provide louvers in generator rooms for the generator whether shown or not. Louver shall be sized for appropriate combustion and cooling required per the manufacturers literature. Include all exhaust piping to take exhaust from muffler to the building exterior and fuel vent to the exterior whether shown or not.
- G. Coordinate mechanical equipment voltage requirements with electrical drawings. Notify the A/E of any discrepancies prior to bid. Make all revisions required to coordinate with no additional cost to the owner.

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- H. Obtain manufacturer's data on all equipment, the dimensions of which may affect mechanical work. Use this data to coordinate proper service characteristics, entry locations, etc., and to ensure minimum clearances are maintained.

1.5 QUALIFICATIONS OF CONTRACTOR:

- A. Contractor performing any part of this scope of work shall be a Florida State Certified Mechanical Contractor (Type CMC)
- B. Provide field superintendent who has had a minimum of four (4) years previous successful experience on projects of comparable size and complexity. Superintendent shall be on the site at all times during construction.

1.6 SITE VISIT/CONDITIONS

- A. Visit the site of this contract and thoroughly familiarize with all existing field conditions and the proposed work as described or implied by the contract documents. During the course of his site visit, verify every aspect of the proposed work and the existing field conditions in the areas of construction which might affect his work. No compensation or reimbursement for additional expenses incurred due to failure or neglect to make a thorough investigation of the contract documents and the existing site conditions will be permitted.
- B. Install all equipment so that all Code required and Manufacturer recommended servicing clearances are maintained. Coordinate the proper arrangement and installation of all equipment within any designated space. If it is determined that a departure from the Contract Documents is necessary, submit to the A/E, for approval, detailed drawings of the proposed changes with written reasons for the changes. No changes shall be implemented without the approval of the engineer.
- C. Submission of a proposal will be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered will not be recognized.
- D. Existing conditions and utilities indicated are taken from existing construction documents, surveys, and field investigations. Unforeseen conditions probably exist and existing conditions shown on drawings may differ from the actual existing installation with the result being that new work may not be field located exactly as shown on the drawings. Field verify dimensions of all site conditions prior to bidding and include any deviations in the contract. Notify A/E if deviations are found.
- E. All existing mechanical is not shown. Become familiar with all existing conditions prior to bidding, and include in the bid the removal of all mechanical equipment, duct, controls wiring, control devices, and control conduits, etc. that is not being reused, back to it's originating point.

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- F. Locate all existing utilities and protect them from damage. Pay for repair or replacement of utilities or other property damaged by operations in conjunction with the completion of this work.
- G. Work is in connection with existing buildings which must remain in operation while work is being performed. Work shall be in accord with the schedule required by the Contract. Schedule work for a minimum shut down to Owner. Notify Owner 72 hours in advance of any shut-down of existing systems. Perform work during non-operating hours unless otherwise accepted by Owner. Protect existing buildings and equipment during construction.

1.7 COMMISSIONING RESPONSIBILITIES

- A. Attend commissioning meetings scheduled by the CM.
- B. Schedule work so that required mechanical installations are completed, and system verification checks and functional performance test can be carried out on schedule.
- C. Inspect, check and confirm in writing the proper installation and performance of all mechanical services as required by the system verification and functional performance testing requirements of mechanical equipment in the commissioning specifications.
- D. Provide qualified personnel to assist and operate mechanical system during system verification checks and functional performance testing of HVAC systems as required by the commissioning specifications.
- E. Provide instruction and demonstrations for the Owner's designated operating staff in accordance with the requirements of the commissioning specifications.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR MECHANICAL INSTALLATION

- A. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both mechanical equipment and other nearby installations. Connect in

**COMMON WORK RESULTS FOR MECHANICAL
SECTION 15050**

such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

- D. Right of Way: Give to piping systems installed at a required slope.
- E. All work shall be executed in a workmanship manner and shall present a neat mechanical appearance upon completion.
- F. Care shall be exercised that all items are plumb, straight, level.
- G. Care shall be exercised so that Code clearance is allowed for all panels, controls. etc., requiring it. Do not allow other trades to infringe on this clearance.
- H. The electrical circuits, components and controls for all equipment are selected and sized based on the equipment specified. If substitutions are proposed, furnish all materials and data required to prove equivalence. No additional charges shall be allowed if additional materials, labor, connections or equipment are needed for substituted products. Any modifications to the electrical design and installation or other trades will also need to be made at no additional cost to the Owner to accommodate the proposed substitutions. Comply with division 1 "substitutions" if allowable.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following duct services:
 1. Indoor, concealed supply and outdoor air.
 2. Indoor, exposed supply and outdoor air.
 3. Indoor, concealed return located in unconditioned space.
 4. Indoor, exposed return located in unconditioned space.
 5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Qualification Data: For qualified Installer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK

jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; SoftTouch Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Friendly Feel Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; Commercial Board.
 - b. Fibrex Insulations Inc.; FBX.
 - c. Johns Manville; 800 Series Spin-Glas.
 - d. Knauf Insulation; Insulation Board.
 - e. Manson Insulation Inc.; AK Board.
 - f. Owens Corning; Fiberglas 700 Series.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.

- d. Mon-Eco Industries, Inc.; 22-25.

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
 - b. Vimasco Corporation; 749.
 - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil (1.09-mm) dry film thickness.
 - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 5. Color: White.

2.4 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Fire- and water-resistant, flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 5. Color: Aluminum.

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABI, Ideal Tape Division; 491 AWF FSK.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - c. Compac Corporation; 110 and 111.
 - d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.7 SECUREMENTS

- A. Insulation Pins and Hangers:
1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) AGM Industries, Inc.; CWP-1.
 - 2) GEMCO; CD.
 - 3) Midwest Fasteners, Inc.; CD.
 - 4) Nelson Stud Welding; TPA, TPC, and TPS.
 2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) AGM Industries, Inc.; CHP-1.
 - 2) GEMCO; Cupped Head Weld Pin.
 - 3) Midwest Fasteners, Inc.; Cupped Head.
 - 4) Nelson Stud Welding; CHP.
 3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) AGM Industries, Inc.; RC-150.
 - 2) GEMCO; R-150.
 - 3) Midwest Fasteners, Inc.; WA-150.

- 4) Nelson Stud Welding; Speed Clips.
 - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- 4. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) GEMCO.
 - 2) Midwest Fasteners, Inc.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

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1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of vapor-barrier mastic at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.**
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

- a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of vapor-barrier mastic at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply, return, outdoor air.
2. Indoor, exposed supply, return, outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with Florida Energy Conservation Code.
3. Factory-insulated flexible ducts.

4. Factory-insulated plenums and casings.
5. Factory-insulated access panels and doors.

3.6 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- B. Concealed, round and flat-oval, return-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- D. Concealed, rectangular, supply-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- E. Concealed, rectangular, return-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- F. Concealed, rectangular, outdoor-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- G. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- H. Concealed, return-air plenum insulation shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- I. Concealed, outdoor-air plenum insulation shall be the following:
 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- J. Exposed, round and flat-oval, supply-air duct insulation shall be the following:
 1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.
- K. Exposed, round and flat-oval, return-air duct insulation shall be one of the following:
 1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.
- L. Exposed, round and flat-oval, outdoor-air duct insulation shall be one of the following:
 1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.
- M. Exposed, round, flat-oval and rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be the following:
 1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.
- N. Exposed, rectangular, supply-air duct insulation shall be one of the following:
 1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

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- O. Exposed, rectangular, return-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

- P. Exposed, rectangular, outdoor-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

- Q. Exposed, return-air plenum insulation shall be one of the following:
 - 1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

- R. Exposed, outdoor-air plenum insulation shall be one of the following:
 - 1. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

END OF SECTION

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.

1.2 DEFINITIONS

- ##### A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

- ##### A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- ##### B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Equipment supports.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - a. B-Line Systems, Inc.
 - b. Globe Pipe Hanger Products, Inc.
 - c. Empire Inc.
 - d. Grinnel Corp.

2.2 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
 - 1. AAA Technology & Specialties Co., Inc.
 - 2. B-Line Systems, Inc.; a division of Cooper Industries.
 - 3. Globe Pipe Hanger Products, Inc.
 - 4. Grinnell Corp.
 - 5. National Pipe Hanger Corporation.
 - 6. Tolco Inc.
- C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

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2.4 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
 - 1. Carpenter & Paterson, Inc.
 - 2. ERICO/Michigan Hanger Co.
 - 3. PHS Industries, Inc.
 - 4. Pipe Shields, Inc.
 - 5. Rilco Manufacturing Company, Inc.
- C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Manufacturers:
 - a. Hilti, Inc.
 - b. ITW Ramset/Red Head.
 - c. Masterset Fastening Systems, Inc.
 - d. MKT Fastening, LLC.
 - e. Powers Fasteners.
- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Manufacturers:

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- a. B-Line Systems, Inc.; a division of Cooper Industries.
- b. Empire Industries, Inc.
- c. Hilti, Inc.
- d. ITW Ramset/Red Head.
- e. MKT Fastening, LLC.
- f. Powers Fasteners.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.

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4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
 6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
 7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
 8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

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6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- N. Use powder-actuated fasteners instead of building attachments where required in concrete construction.

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3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- F. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
- J. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

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- b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 5. Pipes NPS 8 and Larger: Include wood inserts.
 6. Insert Material: Length at least as long as protective shield.
 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.4 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Roof drains and rainwater piping.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. When fire-performance characteristics are important requirements, verify surface-burning characteristics of insulation materials by an independent testing agency and require test report submittals.
- C. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

- D. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.
1. Piping Mockups:
 - a. One 10-foot section of NPS 2 straight pipe.
 - b. One each of a 90-degree threaded, welded, and flanged elbow.
 - c. One each of a threaded, welded, and flanged tee fitting.
 - d. One NPS 2 or smaller valve, and one NPS 2-1/2 or larger valve.
 - e. Four support hangers including hanger shield and insert.
 - f. One threaded strainer and one flanged strainer with removable portion of insulation.
 - g. One threaded reducer and one welded reducer.
 - h. One pressure temperature tap.
 - i. One mechanical coupling.
 2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 4. Obtain Architect's approval of mockups before starting insulation application.
 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed.
- E. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports for Plumbing Piping and Equipment."

- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000-Degree Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Ramco Insulation, Inc.; Super-Stik.
 - b. Or approved equal.
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Ramco Insulation, Inc.; Thermokote V.
 - b. Or approved equal.
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.
 - b. Or approved equal.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.
 - 2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
 - d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
 - b. Vimasco Corporation; 749.
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
 - b. Eagle Bridges - Marathon Industries; 501.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
 - d. Mon-Eco Industries, Inc.; 55-10.
 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 3. Service Temperature Range: 0 to 180 deg F.
 4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 5. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
 1. Products: Subject to compliance with requirements, provide one of the following:

- a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
 - b. Eagle Bridges - Marathon Industries; 570.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
 3. Service Temperature Range: Minus 50 to plus 220 deg F.
 4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 5. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
 - b. Eagle Bridges - Marathon Industries; 550.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
 - d. Mon-Eco Industries, Inc.; 55-50.
 - e. Vimasco Corporation; WC-1/WC-5.
 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: 60 percent by volume and 66 percent by weight.
 5. Color: White.

2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
 - b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
 - c. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass and Phenolic Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Pittsburgh Corning Corporation; Pittseal 444.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
 - d. Mon-Eco Industries, Inc.; 44-05.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 491 AWF FSK.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - c. Compac Corporation; 110 and 111.
 - d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.9 SECUREMENTS

- A. Bands:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping and Seals.
 2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
 3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, stainless steel.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. C & F Wire.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
 - 1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 - 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 - 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 - 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 - 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.
- E. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
 - 2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 - 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

3.7 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material:** Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Color:** Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless-steel jackets.**

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.**
- B. Tests and Inspections:**
1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.**

3.9 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Roof drain bodies and storm water piping:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.
 - 3. Encasement for underground metal piping.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Storm Drainage Piping: 10-foot head of water (30 kPa).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For storm drainage piping, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

- B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm-Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of storm-drainage service.
 - 2. Do not proceed with interruption of storm-drainage service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
 - 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Solvent Cement: ASTM D 2564.
 - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1173.
 - b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
4. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
5. Pressure Transition Couplings:
 - a. Standard: AWWA C219.
 - b. Description: Metal, sleeve-type couplings same size as, with pressure rating at least equal to and ends compatible with, pipes to be joined.
 - c. Center-Sleeve Material: Manufacturer's standard.
 - d. Gasket Material: Natural or synthetic rubber.
 - e. Metal Component Finish: Corrosion-resistant coating or material.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Install storm drainage piping at the following minimum slopes unless otherwise indicated:
 - 1. As required by the 2014 Florida Building Code Plumbing.
- L. Install aboveground PVC piping according to ASTM D 2665.
- M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- N. Install sleeves for piping penetrations of walls, ceilings, and floors.
- O. Install sleeve seals for piping penetrations of concrete walls and slabs.

3.2 JOINT CONSTRUCTION

- A. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.3 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Unshielded, nonpressure transition couplings.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
 - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 - 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 6. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2 : 48 inches with 3/8-inch rod.
 - 2. NPS 3 : 48 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
 - 5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.
- F. Install supports for vertical PVC piping every 48 inches.
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.

**FACILITY STORM DRAINAGE PIPING
SECTION 15410**

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Comply with requirements for cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.6 IDENTIFICATION

A. Identify exposed storm drainage piping.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground storm drainage piping shall be one the following:
 - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

END OF SECTION

STORM DRAINAGE PIPING SPECIALTIES
SECTION 15430

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following storm drainage piping specialties:
 - 1. Cleanouts.
 - 2. Through-penetration firestop assemblies.
 - 3. Roof drains.
 - 4. Miscellaneous storm drainage piping specialties.
 - 5. Flashing materials.
- B. Related Sections include the following:
 - 1. Division 15 Section "Sanitary Waste Piping Specialties" for backwater valves, floor drains, trench drains and channel drainage systems connected to sanitary sewer, air admittance valves, FOG disposal systems, grease interceptors and removal devices, oil interceptors, and solid interceptors.

1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

1.6 COORDINATION

- A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Watts Drainage Products Inc.
 - d. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
5. Closure: Countersunk plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.
8. Standard: ASME A112.3.1.
9. Size: Same as connected branch.
10. Housing: Stainless steel.
11. Closure: Stainless steel with seal.
12. Riser: Stainless-steel drainage pipe fitting to cleanout.

2.2 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ProSet Systems Inc.
2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected pipe.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

STORM DRAINAGE PIPING SPECIALTIES

SECTION 15430

2.3 ROOF DRAINS

A. Metal Roof Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Watts Drainage Products Inc.
 - d. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.21.2M.

2.4 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected piping.

B. Downspout Boots:

1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 outlet; and shop-applied bituminous coating.
2. Size: Inlet size to match downspout.
3. Description: ASTM A 74, Service class, hub-and-spigot, cast-iron soil pipe.
4. Size: Same as or larger than connected downspout.

C. Conductor Nozzles:

1. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.
2. Size: Same as connected conductor.

2.5 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, 12 oz./sq. ft. thickness.

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

STORM DRAINAGE PIPING SPECIALTIES
SECTION 15430

- D. Fasteners: Metal compatible with material and substrate being fastened.
- E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- F. Solder: ASTM B 32, lead-free alloy.
- G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 15 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at base of each vertical soil and waste stack.
- C. Each building drain shall be provided with a two-way grade cleanout within 6' of the junction of the building drain and building sewer immediately after exiting the building. If the two-way cleanout is installed in a grassy area, it shall be embedded in an 18"x18"x4" thick concrete pad.
- D. Each horizontal sanitary and storm drainage pipe shall be provided with a clean out at the upstream end of the pipe and in changes in direction greater than 45 degrees. Offset cleanouts so that they are not located in classrooms or building entrances whenever possible.
- E. Cleanouts shall be provided at 50' intervals for horizontal sanitary drain pipes of 3" or less and 80' intervals for pipes 4" and larger.
- F. Cleanout plug will be encompasses in a concrete pad the measures a minimum of 18" square

and 6" inches in depth.
- G. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- H. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

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- I. Assemble and install ASME A112.3.1, stainless-steel channel drainage systems according to ASME A112.3.1. Install on support devices so that top will be flush with surface.
- J. Assemble non-ASME A112.3.1, stainless-steel channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.
- K. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.
- L. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Division 07.
 - 1. Install roof-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 - 2. Position roof drains for easy access and maintenance.
- M. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- N. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- O. Install manufactured, gray-iron downspout boots at grade with top 6 inches above grade. Secure to building wall.
- P. Install cast-iron soil pipe downspout boots at grade with top of hub 6 inches above grade.
- Q. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.
- R. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

STORM DRAINAGE PIPING SPECIALTIES
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2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
 - C. Set flashing on floors and roofs in solid coating of bituminous cement.
 - D. Secure flashing into sleeve and specialty clamping ring or device.
 - E. Fabricate and install flashing and pans, sumps, and other drainage shapes.
- 3.4 PROTECTION
- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
 - B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Single-wall rectangular ducts and fittings.
 - 2. Sheet metal materials.
 - 3. Sealants and gaskets.
 - 4. Hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Sealants and gaskets.
- B. Shop Drawings:
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Factory- and shop-fabricated ducts and fittings.
 - 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
 - 4. Elevation of top of ducts.
 - 5. Dimensions of main duct runs from building grid lines.
 - 6. Fittings.
 - 7. Reinforcement and spacing.

8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations for selecting hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.

 - f. Perimeter moldings.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

- D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.
 - 6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- E. Round Duct Joint O-Ring Seals:
 - 1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 - 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 - 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.4 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.
- M. Contractor shall include an additional 20% of added ductwork into their price for coordination purposes.

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 , "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel

primer. Paint materials and application requirements are specified in Division 09 painting Sections.

- B. All ductwork located within the ballroom shall be painted. Coordinate with architect to determine the final color.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Test the following systems:
 - a. Supply Ducts with a Pressure Class of 3-Inch wg or Higher: Test representative duct sections totaling no less than 100 percent of total installed duct area for each designated pressure class.
 - 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 4. Test for leaks before applying external insulation.
 - 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 - 6. Give seven days' advance notice for testing.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Contractor shall include an additional 20% of added ductwork into their price for coordination purposes.

3.8 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

- A. Supply Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Constant-Volume Air-Handling Units:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
 3. Ducts Connected to Variable-Air-Volume Air-Handling Units:
 - a. Pressure Class: Positive 3-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- B. Return Ducts:**
1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive or negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
 2. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
- C. Exhaust Ducts:**
1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
 2. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.
 - a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
 - b. Concealed: Carbon-steel sheet.
 - c. Welded seams and joints.
 - d. Pressure Class: Positive or negative 3-inch wg.
 - e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
 - f. SMACNA Leakage Class: 3.
 3. Ducts Connected to Dishwasher Hoods:
 - a. Type 304, stainless-steel sheet.
 - b. Exposed to View: No. 4 finish.
 - c. Concealed: No. 2D finish.
 - d. Welded seams and flanged joints with watertight EPDM gaskets.
 - e. Pressure Class: Positive or negative 3-inch wg.
 - f. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
 - g. SMACNA Leakage Class: 3.
- D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:**
1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

- a. Pressure Class: Positive or negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
2. Ducts Connected to Air-Handling Units:
- a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
- E. Intermediate Reinforcement:
- 1. Galvanized-Steel Ducts: Galvanized steel.
 - 2. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.
- F. Double-Wall Duct Interstitial Insulation:
- 1. Supply Air Ducts: 1 inch thick.
 - 2. Return Air Ducts: 1 inch thick.
 - 3. Exhaust Air Ducts: 1 inch thick.
- G. Elbow Configuration:
- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm :
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.
- H. Branch Configuration:
- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

COMMON WORK RESULTS FOR ELECTRICAL SECTION 16010

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 1. Electrical equipment coordination and installation.
 2. Sleeves for raceways and cables.
 3. Sleeve seals.
 4. Grout.
 5. Common electrical installation requirements.
 6. Commissioning requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 GENERAL REQUIREMENTS

- A. Carefully examine General Conditions, other specification sections, and other drawings (in addition to DIVISION 16), in order to be fully acquainted with their effect on electrical work. Additions to the contract cost will not be allowed due to failure to inspect existing conditions.
- B. Do all work in compliance with 5th Edition Florida Building Code 2014, and the Codes adopted therein, including NFPA 70 (2011 NEC), 5th Edition Florida Fire Prevention Code and the regulations of the local power utility, cable television and telephone companies. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like, and deliver such certificates to the Architect/Engineer.
- C. Cooperate and coordinate with all other trades. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the condition of the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by electrical workmen.
- D. Furnish, perform, or otherwise provide all labor (including, but not limited to, all planning, purchasing, transporting, rigging, hoisting, storing, installing, testing, chasing, channeling, cutting, trenching, excavating and backfilling), coordination, field verification, equipment installation, support, and safety, supplies, and materials necessary for the correct installation of complete and functional electrical systems (as described or implied by these specifications and the applicable drawings).

COMMON WORK RESULTS FOR ELECTRICAL SECTION 16010

- E. Coordinate and verify power and telephone company service requirements prior to bid. Bid to include all work required.
- F. Circuiting and connection of all items using electric power shall be included under this division of the specifications, including necessary wire, conduit, circuit protection, disconnects and accessories. Secure rough-in drawings and connection information for equipment involved to determine the exact requirements. See all divisions of drawings or specifications for electrically operated equipment. If the connection of an item is not shown on the electrical drawings and it is unclear how to provide for the circuiting and connection, notify the engineer of record in writing prior to bidding project. Submission of a bid indicates that the bidder has included these requirements as part of the scope of work.

1.5 DRAWINGS:

- A. Indicate only diagrammatically the extent, general character, and approximate location of work. Where work is indicated, but with minor details omitted, furnish and install it complete and so as to perform its intended functions.
- B. DIVISION 16 work called for under any section of the project specifications, shall be considered as included in this work unless specifically excluded by inclusion in some other branch of the work. This shall include roughing-in for connections and equipment as called for or inferred. Check all drawings and specifications for the project and shall be responsible for the installation of all DIVISION 16 work.
- C. Take finish dimensions at the job site in preference to scale dimensions. Do not scale drawings where specific details and dimensions for DIVISION 16 work are not shown on the drawings, take measurements and make layouts as required for the proper installation of the work and coordination with all drawings and coordination with all other work on the project. In case of any discrepancies between the drawings and the specifications that have not been clarified by addendum prior to bidding, it shall be assumed by the signing of the contract that the higher cost (if any difference in costs) is included in the contract price, and perform the work in accordance with the drawings or with the specifications, as determined and approved by the Architect/ Engineer, and no additional costs shall be allowed to the base contract price.
- D. Carefully check the drawings and specifications of all trades and divisions before installing any of his work. He shall in all cases consider the work of all other trades, and shall coordinate his work with them so that the best arrangements of all equipment, piping, conduit, ducts, rough-in, etc., can be obtained.
- E. Review the specific equipment (such as mechanical, plumbing, kitchen, FFE, etc) minimum circuit ampacity and maximum over current protection requirements of equipment provided by others to confirm it is properly coordinated with the devices being purchased. Notify the AE team immediately upon discovery of discrepancies. This shall be done at the submittal stage prior to purchasing over current protection or installation of conduit, wire, disconnects, breakers, etc. No cost will be allowed for changes to coordinate.
- F. Locations designated for outlets, switches, equipment, etc., are approximate and shall be verified by instruction in these specifications and/or notes on the drawings. Where instructions or notes are insufficient to convey the intent of the design, consult the Architect/Engineer prior to installation.
- G. Obtain manufacturer's data on all equipment, the dimensions of which may affect electrical work. Use this data to coordinate proper service characteristics, entry locations, etc., and to ensure minimum clearances are maintained.

COMMON WORK RESULTS FOR ELECTRICAL SECTION 16010

1.6 QUALIFICATIONS OF CONTRACTOR:

- A. DIVISION 16 Contractor shall have had experience of at least the same size and scope as this project, on at least two other projects within the last five years in order to be qualified to bid this project.
- B. Contractor performing any part of this scope of work shall be a State Certified (Type E.C. License) electrical contractor
- C. Provide field superintendent who has had a minimum of four (4) years previous successful experience on projects of comparable size and complexity. Superintendent shall be on the site at all times during construction and must have an active Journeyman's Electrical License.

1.7 SITE VISIT/CONDITIONS

- A. Visit the site of this contract and thoroughly familiarize with all existing field conditions and the proposed work as described or implied by the contract documents. During the course of his site visit, verify every aspect of the proposed work and the existing field conditions in the areas of construction which might affect his work. No compensation or reimbursement for additional expenses incurred due to failure or neglect to make a thorough investigation of the contract documents and the existing site conditions will be permitted.
- B. Install all equipment so that all Code required and Manufacturer recommended servicing clearances are maintained. Coordinate the proper arrangement and installation of all equipment within any designated space. If it is determined that a departure from the Contract Documents is necessary, submit to the A/E, for approval, detailed drawings of the proposed changes with written reasons for the changes. No changes shall be implemented without the issuance of the required drawings, clarifications, and/or change orders.
- C. Submission of a proposal will be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered will not be recognized.
- D. Existing conditions and utilities indicated are taken from existing construction documents, surveys, and field investigations. Unforeseen conditions probably exist and existing conditions shown on drawings may differ from the actual existing installation with the result being that new work may not be field located exactly as shown on the drawings. Field verify dimensions of all site utilities, conduit routing, boxes, etc., prior to bidding and include any deviations in the contract. Notify A/E if deviations are found.
- E. All existing electrical is not shown. Become familiar with all existing conditions prior to bidding, and include in the bid the removal of all electrical equipment, wire, conduit, devices, fixtures, etc. that is not being reused, back to it's originating point.
- F. Locate all existing utilities and protect them from damage. Pay for repair or replacement of utilities or other property damaged by operations in conjunction with the completion of this work.
- G. Investigate site thoroughly and reroute all conduit and wiring in area of construction in order to maintain continuity of existing circuitry. Existing conduits indicated in Contract Documents indicate approximate locations. Verify and coordinate existing site conduits and pipes prior to any excavation on site. Bids shall include hand digging and all required rerouting in areas of existing conduits or pipes.

COMMON WORK RESULTS FOR ELECTRICAL SECTION 16010

- H. Work is in connection with existing buildings which must remain in operation while work is being performed. Work shall be in accord with the schedule required by the Contract. Schedule work for a minimum outage to Owner. Notify Owner 72 hours in advance of any shut-down of existing systems. Perform work during non-business operating hours unless otherwise accepted by Owner. Protect existing buildings and equipment during construction.

1.8 COMMISSIONING RESPONSIBILITIES

- A. Attend commissioning meetings scheduled by the CM.
- B. Schedule work so that required electrical installations are completed, and system verification checks and functional performance test can be carried out on schedule.
- C. Inspect, check and confirm in writing the proper installation and performance of all electrical services as required by the system verification and functional performance testing requirements of electrical equipment in the commissioning specifications.
- D. Provide qualified personnel to assist and operate electrical system during system verification checks and functional performance testing of HVAC systems as required by the commissioning specifications.
- E. Provide instruction and demonstrations for the Owner's designated operating staff in accordance with the requirements of the commissioning specifications.

1.9 TEMPORARY POWER:

- A. Provide temporary power distribution for the connection of all single phase 120V 20A tools, OSHA work lighting, and testing as required for performance of the project. Provide OSHA required work lighting and task lighting for the project.
- B. If power to any of the existing facilities will be interrupted, coordinate the outage with the Owner at least 72 hours in advance. All power outages will occur outside operational hours as determined by the Owner.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Engineer shall have no responsibility for job site safety and the Contractor shall have full and sole authority for all safety programs and precautions in connection with the Work. Nothing herein shall be interpreted to confer upon the Engineer any duty regarding safety or the prevention of accidents at the jobsite.

COMMON WORK RESULTS FOR ELECTRICAL SECTION 16010

- B. Comply with NECA 1.
- C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- F. Right of Way: Give to piping systems installed at a required slope.
- G. All work shall be executed in a workmanship manner and shall present a neat mechanical appearance upon completion.
- H. Care shall be exercised that all items are plumb, straight, level.
- I. Care shall be exercised so that Code clearance is allowed for all panels, controls. etc., requiring it. Do not allow other trades to infringe on this clearance.

3.2 DEMOLITION

- A. Unless otherwise specified, all equipment and materials shall remain the property of the Owner. Owner shall have first rights to all demolished items if they decide it is usable. This selected property of Owner shall be delivered to a location where directed by Owner within 15 miles of site and all other items shall be removed from the job site and legally disposed of by the Contractor.
- B. Cut no structural members without written approval from the structural engineer of record and Owner.

END OF SECTION

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

SECTION 16060

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes methods and materials for grounding systems, equipment and common ground bonding with lightning protection system.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Comply with UL 467 for grounding and bonding materials and equipment.
- B. Test all ground rod locations as described to confirm quality standard intent is attained.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

SECTION 16060

6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Lugs: Compression of substantial construction, cast copper or cast bronze, with "ground" (micro-flat) surfaces, compression type, two-hole tongue, equal to Burndy or equal by T&B or OZ Gedney. Lightweight and "competitive" devices shall be rejected.
- E. Grounding and Bonding Bushings: Malleable iron, Thomas and Betts (T&B), or equal.
- F. Grounding Screw and Pigtail: Raco No. 983 or equal.
- G. Building Structural Steel, Existing: Thompson 701 Series heavy duty bronze "C" clamp with two-bolt vise-grip cable clamp or equal.

PART 3 - EXECUTION

3.1 EQUIPMENT GROUNDING CONDUCTOR

- A. Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- B. Provide green insulated ground wire for all grounding type receptacles and for equipment of all voltages. In addition to grounding strap connection to metallic outlet boxes, a supplemental grounding wire and screw equal to Raco No. 983 shall be provided to connect receptacle ground terminal to the box.
- C. All plugstrips and metallic surface raceway shall contain a green insulation ground conductor from supply panel ground bus connected to grounding screw on each receptacle in strip and to strip channel. Conductor shall be continuous.

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

SECTION 16060

- D. All motors, all heating coil assemblies, and all building equipment requiring flexible connections shall have a green grounding conductor properly connected to the frames and extending continuously inside conduit with circuit conductors to the supply source bus with accepted connectors regardless of conduit size or type. This shall include Food Service equipment, Laundry equipment, and all other "Equipment By Owner" to which an electric conduit is provided under this Division.

3.2 MAIN ELECTRICAL SERVICE

- A. Bond to all of the following when available on site:
 - 1. Ground Rods
 - 2. Metal Water Pipe (Interior and Exterior to Building)
 - 3. Building Metal Frame, Structural Steel and/or Reinforced Structural Concrete
 - 4. All Piping Entering or Leaving All Buildings (Including Chilled Water Piping)
 - 5. Encasing Electrodes
 - 6. Ground Ring
 - 7. Site Distribution Counterpoise Ground System
 - 8. Lightning Protection System
- B. Ground/bond neutral per NEC.
- C. Bond grounding electrodes to site counterpoise grounding system and lightning protection system where provided.

3.3 LIGHTNING PROTECTION SYSTEMS

- A. Ground per applicable section on lightning protection system, NFPA 780, and as specified herein. The most stringent requirements shall govern.

3.4 EXTERIOR GRADE (OR FREE STANDING ABOVE GROUND) MOUNTED EQUIPMENT

- A. General:
 - 1. All equipment (including chillers, pumps, disconnects, starters, control panels, panels, etc) mounted exterior to building shall have their enclosures grounded directly to a grounding electrode at the equipment location in addition to the building equipment ground connection.
 - 2. Bond each equipment enclosure, metal rack support, mounting channels, etc. to ground electrode system at each rack with an insulated copper ground conductor sized to match the grounding electrode conductor required by applicable table in NEC based on equipment feeder size, but in no case shall conductor be smaller

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS SECTION 16060

than #6 copper or larger than #2 copper. This connection is in addition to grounding electrode connections required for services.

- B. Electrical equipment connection rack mounted equipment.
 - 1. Bond all metal parts as noted above.

3.5 MISCELLANEOUS GROUNDING CONNECTIONS

- A. Provide bonding to meet regulatory requirements.
- B. Required connections to building steel shall be with UL accepted non-reversible crimp type ground lugs exothermically welded to bus bar that is either exothermically welded to steel or bolted to steel in locations where weld will not affect the structural properties of the steel. Required connections to existing building structural steel purlins/I beams shall be with heavy duty bronze "C" clamp with two bolt vise-grip cable clamp.
- C. Grounding conductors shall: be so installed as to permit shortest and most direct path from equipment to ground; be installed in conduit; be bonded to conduit at both ends when conduit is metal; have connections accessible for inspection; and made with accepted solderless connectors brazed (or bolted) to the equipment or to be grounded; in NO case be a current carrying conductor; have a green jacket unless it is bare copper; be run in conduit with power and branch circuit conductors. The main grounding electrode conductor shall be exothermically welded to ground rods, water pipe, and building steel.
- D. All surfaces to which grounding connections are made shall be thoroughly cleaned to maximum conductive condition immediately before connections are made thereto. Metal rustproofing shall be removed at grounding contact surfaces, for 0 ohms by digital Vm. Exposed bare metal at the termination point shall be painted.
- E. Install ground bushings on all metal conduits where the continuity of grounding is broken between the conduit and the electrical distribution system (i.e. metal conduit stub-up from wall outlet box to ceiling space. Provide an appropriately sized bond jumper from the ground bushing to the respective equipment ground bus or ground bus bar.
- F. Each feeder metallic conduit shall be bonded at all discontinuities, including at switchboards and all subdistribution and branch circuit panels with conductors in accordance with applicable table in NEC 250 for parallel return with respective interior grounding conductor.
- G. Grounding provisions shall include double locknuts on all heavywall conduits.

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

SECTION 16060

3.6 TESTING AND REPORTS

- A. Ground resistance measurements shall be made on each system utilized in the project. The ground resistance measurements shall include building structural steel, driven grounding system, water pipe grounding system and other accepted systems as may be applicable. Ground resistance measurements shall be made in normally dry weather, not less than 24 hours after rainfall, and with the ground under test isolated from other grounds and equipment. Resistances measured shall not exceed specified limits.

- B. Upon completion of testing, the testing conditions and results shall be certified and submitted to the Architect/Engineer.

END OF SECTION

LIGHTNING PROTECTION FOR STRUCTURES
SECTION 16671

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes a UL Master Labeled lightning protection system for building elements and building site components.

1.3 DESCRIPTION

- A. A Lightning Protection System shall be provided and installed on the structure by experienced installers in compliance with provisions of Code for Lightning Protection Systems as adopted by the National Fire Protection Association and Underwriters' Laboratories. All equipment to that result shall be included whether or not specifically called for herein with the additional requirement that the system shall meet all the requirements of LPI.
- B. Materials shall comply in weight, size and composition with the requirements of Underwriters' Laboratories and the National Fire Protection Code relating to this type of installation, and shall be UL Labeled.
- C. All materials, where available by any one manufacturer, shall be cast.
- D. System shall comply with the following:
 - 1. LPI
 - 2. Class I for buildings below 75 feet in height
 - 3. UL 96A; Letter of Findings.

1.4 DEFINITIONS

- A. LPI: Lightning Protection Institute.
- B. NRTL: National recognized testing laboratory.

1.5 REFERENCES

- A. ANSI/NFPA 780 - Lightning Protection Code.

LIGHTNING PROTECTION FOR STRUCTURES
SECTION 16671

- B. ANSI/UL 96 - Lightning Protection Components.
- C. LPI - Lightning Protection Institute.
- D. UL 96A - Installation Requirements for Lightning Protection Systems.

1.6 SUBMITTALS

- A. Product Data: For air terminals and mounting accessories.
- B. Shop Drawings: Detail lightning protection system, including air-terminal locations, conductor routing and connections, and bonding and grounding provisions. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.
- C. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include data on listing or certification by an NRTL or LPI.
- D. Certification, that roof adhesive for air terminals is approved by manufacturers of both the terminal assembly and the roofing material.
- E. Field inspection reports indicating compliance with specified requirements.
- F. Operation and Maintenance Data: For Lightning Protection System to include in operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
 - 1. UL Master Label Letter of Findings.

1.7 PROJECT AS-BUILT DOCUMENTS

- A. Record actual locations of air terminals, grounding electrodes, bonding connections, and routing of system conductors on red lined as-built documents.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specialized in lightning protection equipment with minimum five (5) years documented experience and member of the Lightning Protection Institute.
- B. Installer: Authorized installer of manufacturer with minimum five (5) years documented experience and member of the Lightning Protection Institute.

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1.9 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference one (1) week prior to commencing lightning protection work.

1.10 COORDINATION

- A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.
- B. Coordinate installation of air terminals attached to roof systems with roofing manufacturer and Installer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Heary Bros. Lightning Protection Co. Inc.: Premium Line
 - 2. Independent Protection Co.: Premium Line
 - 3. Thompson Lightning Protection, Inc.; Premium Line

2.2 LIGHTNING PROTECTION SYSTEM COMPONENTS

- A. Comply with ANSI/UL 96 and LPI.
- B. Roof-Mounting Air Terminals: NFPA Class I, aluminum, solid, blunt tip unless otherwise indicated.
 - 1. Air Terminals shall be 1/2" solid aluminum, blunt tip manufactured from highly conductive aluminum as required to match roof conductors, and shall have proper base support for surface on which they are attached, and shall be securely anchored to this surface. Terminal tip shall be a minimum of 10" above the object or area it is to protect.
 - 2. Parapet mounted terminals: Designed to extend with offset base beyond parapet cap and extend a minimum of 10" above the top of the wall cap.
- C. Roof-Mounting Air Terminals: NFPA Class I, copper, solid, blunt tip unless otherwise indicated.
 - 1. Air Terminals shall be 3/8" solid aluminum, blunt tip manufactured from highly conductive aluminum as required to match roof conductors, and shall have proper base support for surface on which they are attached, and shall be

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- securely anchored to this surface. Terminal tip shall be a minimum of 10" above the object or area it is to protect.
2. Parapet mounted terminals: Designed to extend with offset base beyond parapet cap and extend a minimum of 10" above the top of the wall cap.
- D. Ground Rods, Ground Loop Conductors, and Concrete-Encased Electrodes: Comply with Division 16 Section "Grounding and Bonding for Electrical Systems" and with standards referenced in this Section.
- E. Roof main conductors shall be aluminum 95lb/1000ft, 14 AWG strand, 98,600 circular mils minimum. Copper down conductor shall be copper 375lb/1000ft, 15AWG strand, and 115,000 circular mil minimum. Transition from copper to aluminum shall be via an approved bimetallic connector.
- F. Roof main conductors shall be copper 187.5lb/1000ft, 17 AWG strand, 57,400 circular mils minimum. Copper down conductor shall be copper 375lb/1000ft, 15AWG strand, and 115,000 circular mil minimum. Transition from copper to aluminum shall be via an approved bimetallic connector.
- G. Cable Fasteners: Electrolytically compatible with the conductor and mounting surface with sufficient strength to support the conductor.
- H. Bonding Devices, Cable Splicers and Miscellaneous Connectors: Exothermic welded connection for all connections unless otherwise noted. Cast or stamped crimp fittings are not acceptable for any use.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install lightning protection components and systems according to UL 96A and NFPA 780.
- B. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends and narrow loops.
- C. Conceal the following conductors:
1. System conductors.
 2. Down conductors.
 3. Interior conductors.
 4. Conductors within normal view from exterior locations at grade within 200 feet (60 m) of building.
 5. Notify Architect at least 48 hours in advance of inspection before concealing lightning protection components.
- D. Cable Connections: Use approved exothermic-welded connections for all conductor splices and connections between conductors and other components unless otherwise

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noted. Utilize a torque wrench to properly tighten all above grade bolted connections. Tighten in accordance with manufacturer's instructions.

- E. Lightning protection system shall be bonded to metal bodies as required by NFPA 780.
- F. Air Terminals on membrane roofing: Comply with adhesive manufacturer's written instructions.
- G. Bond extremities of vertical metal bodies exceeding 60 feet (18 m) in length to lightning protection components.

3.2 CORROSION PROTECTION

- A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.
- B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.
- C. All components in direct contact with earth shall be copper.

3.3 FIELD QUALITY CONTROL

- A. Obtain the service of Underwriters Laboratories, Inc. to provide inspection and certification of the lightning protection system under provisions of UL 96A. Submit certification and submit in O & M Manual.
- B. Obtain UL Letter of Findings and submit to OAR and include copy in O & M Manual.

END OF SECTION