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SECTION-B 2.23

FIRE STOP & SMOKE SEAL

2.1.1 PREAMBLE

A. In line with the requirements of the Mumbai Fire Brigade (No FB/HR/City/155, date 04/07/2010)/latest the following items shall incorporated into the MEP design under separate package. The Contractor shall make full allowance for these requirements in his overall MEP tender:

B. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

C. Work of this Section shall conform to the requirements of the Sub-contract Documents and acceptable to Client's Representative / Local authorities and relevant ASTM,UL and NEC standards

D. Provide fire stopping to all services passing through vertical and horizontal fire compartments.

E. Where services penetrate any fire rated barrier, the Contractor shall seal the horizontal & vertical penetration with the use of an appropriate fire sealant material to ensure the integrity of the fire barrier as per tender documents.

2.1.2 SUMMARY

A. General: This section of specification defines the technical requirements for fire stop & smoke seal as specified in accordance with the requirements of the Contract Documents and codes having jurisdiction.
B. Scope of work: Design, supply, installation, Inspection, Testing at Manufacturer's Works, Delivery to Site, storage and handling of fire stop material, complete as specified in the schedule of requirement meeting the intents of the Tender. This specification shall be used in conjunction with all drawings, Schedule of requirement and BOQ attached.
C. Codes & Standards: The fire sealant shall be designed, manufactured and tested in accordance with the latest applicable sections of the ASTM, UL and NEC standards.
D. Requirements of ASTM, UL and NEC standards or any other internationally recognised standard which ensure a quality equal to or better than as per the standards indicated below shall also be acceptable. When the product conforms to any other standards, salient points of difference between the standards adopted and those prescribed in this specification shall be clearly brought out in the tender and a copy of the applicable standards(s) in English language shall also be enclosed by the supplier with the tender.
E. Standard reference:-

NBC	National Building Code 2005
	Local CFO requirement
UBC	Uniform Building Code 1997
ASTM E814-00	Standard Test Method for Fire Tests of Through-Penetration Fire Stops
UL1479	Standard for Fire Tests of Penetration Fire stops
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
UL2079	Standard for Tests for Fire Resistance of Building Joint System
ASTM E119	Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E2174	Standard Practice for On-Site Inspection of Installed Firestops
BS 476	Fire tests on building materials and structures.
Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.	
1.	UL Fire Resistance Directory:
	a) Firestop Devices (XHJI)
	b) Fire Resistance Ratings (BXRH)
	c) Through-Penetration Firestop Systems (XHEZ)
	d) Fill, Voids, or Cavity Material (XHHW)
	e) Forming Materials (XHKU)
	f) Perimeter Fire Containment Systems (XHDG)
2.	Alternate Systems: "Omega Point Laboratories Directory" (updated

	annually).
ASTM E 1966	Standard Test Method for Fire Resistive Joint Systems
ASTM E 2307	Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
ASTM D6904,	Standard Practice for Resistance to Wind Driven Rain for Exterior Coatings Applied on Masonry
ASTM C 679	Standard Test Method for Tack-Free Time of Elastomeric Sealants
	International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments
NFPA 101	Life Safety Code
NFPA 70	National Electric Code

2.1.3 SUBMITTALS

A. Technical Data: Submit data for approval including, but not limited to, the following:

1. Product Data: Submit each fire stopping and smoke sealing material manufacturer's detailed preparation and installation instructions covering all conditions of the Work, with copies of Code approvals.

2. List: With Product Data, include an itemized listing of all openings and penetrations to receive fire stopping and smoke sealing systems, each listed item accompanied by fire stopping and smoke sealing material manufacturers' UL Classification Number for the specific opening or penetration, based on the classification tests performed according to ASTM E814 and UL 1479 and UL approved.

3. Typical installations may be listed by room number with fire stopping and smoke sealing identified by type for the listed rooms.

4. Submit material safety data sheets provided with product delivered to job-site.

B. Samples of each fire stop and smoke seal, if requested by the Engineer/client.

C. Shop and Construction Drawings:

1. Submit shop drawings, product data, and manufacturer's installation instructions for all materials and prefabricated devices, providing descriptions sufficient for identification at the job site.

2. Submit shop drawings showing proposed material, reinforcement, anchorage, fastenings, and method of installation. Construction details shall accurately reflect actual job conditions.

D. Certificate of Origin: For each lot of fire sealant & smoke seal supplied, provide a certificate of origin issued by manufacturer stating origin, date of manufacture, composition, Standards to which it complies and test certificates. All test certificates are to comply with the test requirements of the relevant standard to which the cable is manufactured, (i.e. type).

E. As-Built (Record) Drawings: At Project close-out, submit Record Drawings of fire sealant material for MEP services as per site installation.

F. Product Certificates: Signed by manufacturers of fire stop & smoke seal certifying that the products furnished comply with requirements.

G. Routine tests at factory.

H. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

I. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

J. Product Test Reports: Indicate compliance of fire stop and fire seal with requirements based on comprehensive testing of current products.

K. Maintenance Data: For fire stop & smoke seal to be included in the maintenance manuals.

L. Certificate: Upon completion, the OEM shall inspect all fire stopping and smoke. sealing, and shall submit a written certification to the employers representative that all materials and workmanship conform to the Specifications and governing code requirements, and are satisfactory to CFO requirements.

M. Method statement shall be submitted in line with manufacturer recommendation for client's approval.

2.1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Work of this Section shall be governed by the requirements of the NBC 2005 & Uniform Building Code (UBC), 1997 Edition, CFO requirements, except as such requirements may be exceeded herein or indicated, or deviations from the UBC requirements are specifically authorized in advance by the Engineer.

B. Fire stopping and Smoke Sealing Materials and Systems: UL Classification Number listed in UL Fire Resistance Directory. The fire stopping and smoke barrier assemblies shall not lower the fire rating and shall not damage structural integrity of the fire-rated assembly.

C. Fire stopping materials shall comply with ASTM E814 and UL 1479 test standards for performance of through-penetrations, and shall comply with ASTM E119 test standards for performance of floors, ceilings, walls, and partitions under fire exposure.

D. The fire stop compound shall not contain any solvents or inorganic fibres. The penetrations seal material must be unaffected by moisture and must maintain the integrity of the floor or wall assembly for its rated time period.

E. Fire-Test-Response Characteristics: Provide through-penetration fire stop systems and fire-resistive joint systems that comply with specified requirements of tested systems.

F. Proposed fire stop materials and methods shall conform to applicable governing codes having local jurisdiction.

G. Fire stop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

2.1.5 PRODUCT DELIVERY

A. Deliver all fire stopping and smoke sealing materials to the site in sealed factory-labeled containers, labels bearing statement of conformance to standards specified for each material.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

2.1.6 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

F. Comply with ASTM D 6905 (modified) for resistance to wind driven rain and water.

2.1.6 MANUFACTURERS

A. Approved Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those specified in Section G.

2.1.7 INSTALLER

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

B. Installation Responsibility: assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.

C. The work is to be installed by a contractor with at least one of the following qualifications:

D. Firm with not less than 3 years experience with fire stop installation.

E. Successfully completed not less than 3 comparable scale projects using similar systems.

2.1.8 PERFORMANCE REQUIREMENTS

A. For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating services, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479.

1. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provides products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

2. For floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

3. The fire proof sealing system shall fully comply with the requirements of relevant standard. The fire proof seal system shall have minimum one/two hour fire resistance rating as per fire zoning of the project.

4. The material used in fire proof seal system shall be non-toxic and harmless to the working personnel.

5. For Plumbing, HVAC & fire fighting services:-
   a. Piping penetrations for plumbing and wet-pipe sprinkler systems provide moisture-resistant through-penetration firestop systems.
   b. Fire sealant arrangement for fire dampers, rising piping, horizontal piping(for fire protection services etc
   c. For penetration involving insulated piping, provide through- penetration fire stop system not requiring removal of insulation.
   d. Provide fire stop compound for caulk, pour, trowel or pump application. Material must be capable of sealing openings around single or multiple pipes, cable against fire, smoke & toxic gases and maintaining rating with a thickness no greater than the structure. Material shall be approved by client's representative & local authorities.
   e. Provide appropriate fire sealant for plastic & metal pipes as different sizes.

6. LV & ELV services:-
   a. All the floor/wall openings provided for cable crossing shall be sealed by fire seal system.
   b. The fire proof seal system shall be physically, chemically, thermally stable and shall be mechanically secured to the masonry concrete members. The system shall be completely gas and smoke tight, ant, rodent and anti-termite.
   c. Type of fire proof seal system shall be foaming type or flame mastic type compound or approved equivalent.
   d. After laying and jointing work is completed, high voltage test should be applied to all cables to ensure that they have not been damaged during or after the laying operation and that there is not fault in the jointing.
   e. For exact details of fire sealing arrangement for bus duct, cable Tray/Ladder, conduits etc. Vendor to provide typical details with exact material description for approval.
   f. For cable penetration cementatious material and paint for cable upto 1mtrs approx can be used.

C. Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other ashes, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.

1. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equalling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities and L-ratings indicated as determined by UL 2079.

2. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450 respectively, as determined per ASTM E 84.

2.1.8 PRODUCTS

A. FIRESTOPPING AND SMOKE SEALS

1. Provide asbestos-free fire stopping and smoke seal materials capable of maintaining an effective barrier against flame, smoke, and gases in compliance with the requirements of ASTM E814 and UL 1479 and providing the fire-rating as indicated on Drawings.

2. Furnish UL labelled and listed fire and smoke and barrier systems, complete with metal collars, incombustible mineral wool or fibrous glass packing's and seals, and other accessories required for complete sealing of penetrations. In the fire safing system as required, include polymer fire stopping sealant that has been tested in accordance with ASTM E814, is UL listed and labelled, and that meets the minimum 2- hour fire resistive requirements for the location where installed.

3. Selection: Provide system selected to meet actual conditions at the site, conforming systems from one or more of the following manufacturers:

B. Systems: Product shall be manufactured using latest & accepted technology available in the market. Products shall be used only within a UL labelled and below listed types:
1. Latex Calking:
2. Putty:
3. Wrap Strip:
4. Compound:
   a. Mineral Fiber
   b. Foam:
5. Silicone Sealant:
6. Intumescent sealant
7. Vermiculite cement
8. Acoustic

2.1.9 EXECUTION

A. PREPARATION

1. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

2. Verify penetrations are properly sized and in suitable condition for application of materials.

3. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

4. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

5. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

6. Do not proceed until unsatisfactory conditions have been corrected.

B. EXAMINATION

1. Report to the Engineer, in writing, all conditions that interfere with or prevent correct installation of Work of this Section. Do not proceed with installation in affected areas until adverse conditions are eliminated or corrected.

2. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed according to specified requirements.

3. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

4. Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.

5. Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector.

C. INSTALLATION

1. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory or Omega Point Laboratories Directory.

2. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.

3. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

4. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

5. Protect materials from damage on surfaces subjected to traffic.

D. APPLICATION

1. Use materials best suited to installation as recommended by the fire stopping manufacturer to meet field conditions. Confirm preparation of surfaces, mixing, and application to manufacturers' printed instructions and UL requirements.

2. to thicknesses as required to provide the fire resistance ratings. Seal all holes or voids made by penetrations to ensure an effective fire and smoke stops where required. Install fire stopping materials so void openings 100 mm or larger will support required floor load, unless the opening is protected from possible loading or traffic.

E. FIELD QUALITY CONTROL

1. OEM certification shall be provided for fire stop & smoke seal installation.

2. Inspecting Agency: The Engineer may engage a qualified, independent inspecting agency to inspect through-penetration fire stops, and fire resistive joint systems. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

3. Contractor shall provide necessary certification for the products as well as installation for each type of installation

4. Where deficiencies are found, repair or replace through-penetration fire stop or smoke seal systems so they comply with requirements. Proceed with enclosing fire stop or smoke seal systems with other construction only after inspection reports are issued and installations comply with requirements.

5. Manufacturer’s Field Services: During Installation, provide periodic destructive testing inspections to assure proper installation/application. After installation is complete, submit findings in writing indicating whether or not the installation of the tested system identified was installed correctly.

F. IDENTIFICATION & DOCUMENTATION

1. The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration and joint location on the entire project. The Documentation Form for through penetrations is to include:

   a. A Sequential Location Number
   b. The Project Name
   c. Date of Installation
   d. Detailed description of the penetrations location

e. Tested System or Engineered Judgment Number
f. Type of assembly penetrated
g. A detailed description of the size and type of penetrating item
h. Size of opening
i. Number of sides of assemblies addressed
j. Hourly rating to be achieved
k. Installers Name

2. The Documentation Form for Construction Joints is to include:

a. A Sequential Location Number
b. The Project Name
c. Date of Installation
d. Detailed description of the Construction Joints location
e. Tested System or Engineered Judgment Number
f. Type of Construction Joint
g. The Width of the Joint
h. The Lineal Footage of the Joint
i. Number of sides addressed
j. Hourly rating to be achieved
k. Installers Name

3. Copies of these documents are to be provided to the general contractor at the completion of the project.

4. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, pre printed vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
   a. The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."
   b. Contractor's Name, address, and phone number.
   c. Through-Penetration firestop system designation of applicable testing and inspecting agency.
   d. Date of Installation.
   e. Through-Penetration firestop system manufacturer's name.
   f. Installer's Name.

G. CLEANING AND PROTECTING

1. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by fire stop system manufacturers and that do not damage materials in which openings occurs.

2. Provide final protection and maintain conditions during and after installation that ensure that through-penetration fire stop systems are without damage or deterioration occurs, cut out and remove damaged or deteriorated fire stop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION- B 2.23