



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada

Fire Stopping and Fire Dampers in Fire Rated Separations

**Greenhouse and Processing Crops Research Centre
2585 County Road 20
Harrow, Ontario**

Project No.:

Issue Date: 2014-02-14

Project Specifications

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1.0 Consultants

Donald Ardiel Architect
470 Ambleside Drive
London, Ontario
N6G 4W9



2014-02-14

END OF SECTION

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PART 1 - GENERAL

- 1.1 PRECEDENCE .1 For Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual.
- 1.2 WORK COVERED BY CONTRACT DOCUMENTS .1 Work of this Contract comprises remedial work to existing fire rated separations to ensure the integrity of the separation. The building is located at 2585 County Road 20, Harrow Ontario. Work includes, but is not limited to:
- .1 installation of fire stopping systems in sleeved and unsleeved openings in masonry and concrete walls and floor slabs containing metal and plastic fume hood exhaust ducts, metal supply and exhaust room air ducts, piping, conduit, and/or cabling, or no services, in locations identified in the fire stopping schedule and fire stopping images,
 - .2 installation of fire stopping systems in irregular openings and structural member penetrations in masonry and concrete walls and floor slabs in locations identified in the fire stopping schedule and fire stopping images.
 - .3 installation of fire dampers at wall-mounted room air exhaust grilles.
- .2 Work excluded from the scope of this contract includes:
- .1 replacement of existing mineral fibre batt fire stopping packing remaining from original construction, unless otherwise indicated in the fire stopping schedule and fire stopping images
- 1.3 CONTRACT METHOD .1 Construct Work under single, stipulated price contract.
- 1.4 WORK COORDINATION .1 Construct Work to accommodate Owner's use of premises, including access to and through the front entrance and access to offices and laboratories.
- 1.5 CONTRACTOR USE OF PREMISES .1 Contractor shall limit use of premises for Work, for limited storage, and for access, to allow;
- .1 Owner occupancy.
 - .2 Work by other contractors.
- .2 Coordinate use of premises under direction of Departmental Representative.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- 1.6 OWNER OCCUPANCY .1 Owner will occupy premises during entire construction period for execution of normal operations. Access to exits is not to be obstructed during construction.
- .2 Cooperate with Owner in scheduling operations to minimize conflict

and to facilitate Owner usage.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 MINIMUM
STANDARDS

- .1 Execute work to meet or exceed:
 - .1 National Building Code of Canada 2010, National Fire Code of Canada 2010, Ontario Building Code 2012 and any other code of provincial or local application, including all amendments up to project date, provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
 - .2 Rules and regulations of authorities having jurisdiction.
 - .3 Fire Commissioner of Canada, No. 301, Standard for Construction Operations, and No. 302, Occupational Safety and Health, Chapter 3-6, Feb. 1992.
 - .4 Observe and enforce construction safety measures required by National Building Code, Part 8 Safety Measures at Construction and Demolition Sites, Occupational Health and Safety Act and Regulations for Construction Projects, Revised Statutes of Ontario 1990, Chapter O.1 as amended, O. Reg. 213/91 as amended by O. Reg. 631/94, O. Reg. 143/99, O. Reg. 571/99, O. Reg. 145/00, O. Reg. 527/00, R.R.O. 1990, Reg. 834, O. Reg. 278/05 (Asbestos), Workplace Safety and Insurance Board and municipal statutes and authorities.
 - .5 Environmental Protection Act, O. Reg. 102/94 and O. Reg. 103/94.

1.2 AUTHORITIES
HAVING JURISDICTION

- .1 The Fire Commissioner of Canada is the sole authority having jurisdiction over this project with regards fire standards.
- .2 Fire Testing requirements are for ULC or WHI listed and labeled products.
- .3 Substitution of ULI or other Fire testing reports for required ULC and WHI testing is acceptable to the Departmental Representative only if the issuing organization is accredited and listed in the "Directory of Accredited Certification Organizations (CAN-P-1505C), 1993" published by the Standards Council of Canada, 1-800-267-8220. Testing shall be to the Canadian standards and the tested products shall bear the appropriate label approved by the Fire Commissioner of Canada.
- .4 Submit 3 copies of test reports under the letterhead of the accredited organization to the Departmental Representative.

1.3 SAFETY PLANS
FOR WORK ORDERS

- .1 Provide a Fire Safety Plan, specific to the work location, in accordance with NBC 2010, Division B, Part 8, Article 8.1.1.1 and NFC 2010, Division B, Part 2, subsection 2.8.2 prior to commencement of work. The plan shall be coordinated with, and integrated into, the existing Facility Emergency Procedures and Evacuation Plan in place at the site. Departmental Representative will provide Facility Emergency Procedures and Evacuation Plan. Deliver two copies of the Fire Safety Plan to the Departmental Representative not later than 14 days before commencing work.
- .2 On award of Contract, submit to Departmental Representative, two

copies of Contractor's and sub-contractors':

- .1 Site Specific Safety Plan.
- .2 Safety Communication Plan.
- .3 Emergency Procedures Plan.

- 1.4 TAXES
- .1 Pay applicable Federal, Provincial and Municipal taxes.
- 1.5 FEES, PERMITS, CERTIFICATES AND LETTERS
- .1 Provide authorities having jurisdiction with information requested.
 - .2 Pay fees and obtain certificates, permits and letters required.
 - .3 Obtain Fire Commissioner of Canada Inspection Letter of Deficiencies from Departmental Representative. Submit a copy of the FCC letter with a list of remedial measures taken to correct deficiencies.
 - .4 Furnish certificates, permits and letters when requested.
- 1.6 EXAMINATION
- .1 Examine existing conditions and determine conditions affecting work.
- 1.7 DOCUMENTS
- .1 Keep one copy of contract documents and shop drawings on the site.
- 1.8 SUBMITTALS PROCEDURES
- .1 Submit number of hard copies specified for each type and format of submittal and in also submit in electronic format as pdf files. Forward pdf files on CD, USB or through email.
- 1.9 CONTRACTOR'S AS-BUILT DRAWINGS AND SPECIFICATIONS
- .1 As work progresses, neatly record significant deviations from the Contract drawings and specifications using fine, red marker on full size white prints and specifications. Make the same changes on the electronic files.
 - .2 Neatly print lettering and numbers in size to match original. Lines may be drawn free-hand but shall be neat and accurate. Add at each title block note: "AS BUILT". Also circle on List of Drawings each title and number of drawing marked with "AS-BUILT" information. Circle on Table of Contents each specification section number and title of specification sections marked with "AS-BUILT" information.
 - .3 Record following significant deviations:
 - .1 Significant deviations which are concealed in construction and can not be identified by visual inspection.
 - .6 Alternative materials and systems installed replacing original materials and systems specified by trade name.
 - .4 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work.
 - .5 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one

set of drawings and specifications marked "AS-BUILT".

1.10 OPERATIONS AND
MAINTENANCE DATA

- .1 On completion of project submit to Departmental Representative 2 copies of Operations and Maintenance Data assembled in 2 255 x 295 mm vinyl-covered, 3-ring, loose-leaf binders with title sheet labeled "Fire Stopping Materials and Instructions - 2013", project title, date and list of contents. Organize content into applicable sections between hard paper dividers with labeled tabs as necessary.
- .2 Include in each binder warranties and guarantees in form approved by Departmental Representative and suppliers' names and addresses, names, addresses and phone numbers of sub-contractors and suppliers, list of materials with names of manufacturer and source of supply. Neatly type lists and rates. Use clear drawings, diagrams or manufacturer's literature.

1.11 SHOP DRAWINGS
AND PRODUCT DATA
SHEETS

- .1 Prior to submission check and certify as correct, shop drawings and product data sheets. Issue to Departmental Representative each submission at least 14 days before dates reviewed submission will be needed.
- .2 Submission two copies of WHMIS MSDS – Material Safety Data Sheets for each product used in fire stopping assembly and/or materials.
- .3 Where technical sections specify that shop drawings bear the stamp of a Registered Professional Engineer, the Engineer must be registered in the Province of Ontario.
- .3 Submit 3 prints and 1 electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .4 The review of shop drawings and product data sheets by Agriculture and Agri-Food Canada (AAFC) is for sole purpose of ascertaining conformance with general concept. This review shall not mean that AAFC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.
- .5 Submit 3 prints and 1 electronic of product data sheets for standard manufactured items. Indicate VOC's in g/l for adhesives, primers, sealants, paints, curing and sealing compounds, sealers, particleboard, plywood, preserved wood, and any other product that emits more than 25 g/l VOC during application, curing, initial off gassing or end use.
- .6 Responsibility for errors, omissions or deviations from requirements of Contract Documents is not relieved by Departmental Representative's review of submittals.

1.12 DESIGN DATA,
TEST REPORTS,
CERTIFICATES,
MANUFACTURER'S
INSTRUCTIONS,
MANUFACTURER'S
FIELD REPORTS

- .1 Prior to submission check and certify as correct each submission. Issue to Departmental Representative each submission at least 14 days before reviewed submission will be needed.
- .2 Submit 3 white print copies of each item requested.
- .3 For products bearing the 'Ecologo' of the Environmental Choice Program, Environment Canada, Canadian Environmental Protection Act, Environmental Choice Product Guidelines:
 - .1 Submit two copies of the licensing criteria statements and the verification of compliance with Sections 3(a) and 3(b) of the ECP to the Departmental Representative. For adhesives, paints, primers and sealants, cleaners and degreasers, floor polishes, water borne surface coatings, indicate VOC in g/l.
 - .2 Alternatively, material in original containers bearing the 'Ecologo' or products bearing the 'Ecologo' will satisfy this requirement.
- .4 Responsibility for errors, omissions or deviations from requirements of Contract Documents is not relieved by Departmental Representative's review of submittals.

1.13 SAMPLES

- .1 Submit duplicate samples of fire stopping materials.
- .2 Identify manufacturer's name and product.
- .3 Installed work shall match reviewed sample.

1.14 ADDITIONAL
DRAWINGS

- .1 Departmental Representative may furnish additional drawings to clarify work.
- .2 Such drawings become part of Contract Documents.

1.15 PROTECTION

- .1 Protect existing work from damage.
- .2 Replace damaged existing work with material and finish to match original.
- .3 Move furniture and fittings and replace following completion of each work period.
- .4 Cover furniture and fittings prior to commencing work.
- .5 Remove coverings and clean following completion of each work period.

1.16 EXISTING
SERVICES

- .1 Establish location, protect and maintain existing utility lines.
- .2 Maintain existing services in occupied areas.
- .3 Use designated existing sanitary facilities.
- .4 Use existing water and electrical services at no cost.
- .5 Use elevator designated, protect walls from damage.

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- 1.17 TEMPORARY FACILITIES AND SERVICES
- .1 Provide and maintain temporary facilities and services required to carry out work.
 - .2 Remove temporary facilities and services on completion of work.
- 1.18 MATERIAL AND EQUIPMENT
- .1 Use new products unless otherwise specified.
 - .2 Deliver and store material and equipment to manufacturer's instructions with manufacturer's labels and seals intact.
 - .3 When material or equipment is specified by standard or performance specifications, upon request of Departmental Representative, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.
- 1.19 FASTENINGS
- .1 Provide fastenings of type, size and spacing required to assure secure anchorage.
 - .2 Obtain Departmental Representative's permission before using explosive actuated fasteners.
- 1.20 CO-ORDINATION AND CO-OPERATION
- .1 Site, building and work areas will be occupied during execution of work.
 - .2 Execute work with minimum disturbance to occupants, public and normal use of site, building, and work areas..
- 1.21 INSPECTION AND TESTING
- .1 When initial tests and inspections reveal work not to contract requirements, pay for tests and inspections required by Departmental Representative on corrected work.
- 1.22 COST BREAKDOWN
- .1 Within 48 hours of notification of acceptance of bid furnish a cost breakdown by Section aggregating contract price.
 - .2 Show separately cost of equipment purchased exempt from Ontario Retail Sales Tax under your Ontario Sales Tax license number.
 - .3 Within 48 hours of acceptance of bid submit a list of subcontractors.
- 1.23 SCHEDULING
- .1 On award of contract submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion. When schedule has been reviewed by the Departmental Representative take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative.
 - .2 Carry out work Monday to Friday from 8:00 to 16:00 hours.
 - .3 Carry out noise generating work Monday to Friday from 17:00 to 22:00 hours..
 - .4 Interior painting of washrooms, service areas, new space or unoccupied

space may be carried out during normal working hours.

.1 Provide continuous ventilation during and after application of paint. Run ventilation system 24 hours per day during installation at 30% outside air; provide continuous ventilation for 7 days after completion of application of paint.

1.24 CLEANING

.1 Maintain project free of accumulated waste and rubbish.

.2 Final cleaning:

.1 Remove temporary protection.

.2 Remove dust, dirt and foreign matter from surfaces. HEPA vacuum interior surfaces.

.3 Broom clean paved exterior surfaces, rake clean other exterior surfaces.

1.25 CONSTRUCTION &
DEMOLITION WASTE

.1 Carefully deconstruct and source separate materials/equipment and divert from D&C waste destined for landfill to maximum extent possible.

.2 Contractor is allowed to remove material from AAFC site only with AAFC approval.

.3 Provide facilities for collection, handling and storage of source separated wastes.

1.26 ASBESTOS
DISCOVERY

.1 If during alteration work existing asbestos material is discovered (e.g. fireproofing, acoustic or thermal insulation, pipe or tank covering) stop work and immediately notify Departmental Representative. Do not remove any existing material containing asbestos fibres.

1.27 DESIGNATED
SUBSTANCES

.1 The project site has been surveyed for the presence of designated substances referred to in the Occupational Health and Safety Act and Regulations for Construction Projects, O.Reg. 213/91 as amended.

.2 The Designated Substances Survey, Agriculture and Agri-Food Canada, London Facility, 1391 Sandford Street, Project No. 515896L prepared by Trow Associates Inc., dated December 2005 will be available from the Owner.

1.28 SPECIAL
PROTECTION AND
PRECAUTIONS

.1 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and the provision of material safety data sheets acceptable to HRSDC - Labour Program.

1.29 IAQ - INDOOR
AIR QUALITY

.1 Comply with CSA Z204-94(R1999), Guideline for Managing Indoor Air Quality in Office Buildings.

1.30 POLLUTION
CONTROL

.1 Spills of deleterious substances:

.1 Immediately contain, limit spread and clean up in accordance with provincial regulatory requirements.

.2 Report immediately to Ontario Spills Action Centre:
1-800-268-6060.

.3 Further information on dangerous goods emergency cleanup and precautions including a list of companies performing this work can be obtained from the Transport Canada 24-hour number (613) 996-6666 collect.

PART 2 - PRODUCTS

2.1 NOT USED .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not used.

END OF SECTION

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PART 1 - GENERAL

1.1 REFERENCES

- .1 National Building Code 2010 (NBC):
 - .1 NBC 2010, Division B, Part 8 Safety Measures at Construction and Demolition Sites.
- .3 National Fire Code 2010 (NFC):
 - .1 NFC 2005, Division B, Part 2 Emergency Planning, subsection 2.8.2 Fire Safety Plan.
- .4 Province of Ontario:
 - .1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and Regulations for Construction Projects, O. Reg. 213/91 as amended.
 - .2 Workplace Safety and Insurance Act, 1997.
 - .3 Municipal statutes and authorities.
- .5 Fire Commissioner of Canada (FCC):
 - .1 FC-301 Standard for Construction Operations, June 1982.

Labour Program
Fire Protection Engineering Services
4900 Yonge Street 8th Floor
North York, Ontario M2N 6A8

and copies may be obtained from:

Human Resources and Social Development Canada
Labour Program
Fire Protection Engineering Services
Ottawa, Ontario K1A 0J2

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 11 01.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operations found in work plan.
 - .3 Measures and controls to be implemented to address identified safety hazards and risks.
- .3 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.
- .4 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's

overall responsibility for construction Health and Safety.

- .5 Submit names of personnel and alternates responsible for site safety and health.
- .6 Submit copies of orders, directions or reports issued by health and safety inspectors of the authorities having jurisdiction.
- .7 Submit copies of incident and accident reports.
- .8 Submit Material Safety Data Sheets (MSDS) in accordance with Section 01 11 01.
- .9 Submit Workplace Safety and Insurance Board (WSIB)- Experience Rating Report.

1.3 SAFETY
ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.

1.4 REGULATORY
REQUIREMENTS

- .1 Comply with the Acts and regulations of the Province of Ontario.
- .2 Comply with specified standards and regulations to ensure safe operations at site.

1.5 PROJECT/SITE
CONDITIONS

- .1 Refer to the Designated Substances Report for a list of all designated substances on the site.

1.6 COMPLIANCE
REQUIREMENTS

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990 Chapter 0.1, as amended.

1.7 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 Where applicable the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act for the Province of Ontario.

1.8 UNFORSEEN
HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.
- .2 Follow procedures in place for Employees Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.

1.9 CORRECTION OF
NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.10 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
- .2 Assign responsibility and obligation to Competent Supervisor to stop or start Work when, at Competent Supervisor's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.

PART 2 – PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

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PART 1 - GENERAL

1.1 SECTION
INCLUDES

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.
- .3 Equipment and system adjust and balance.

1.2 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.3 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.7 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in the opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative may deduct from Contract Amount difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Departmental Representative.

1.12 EQUIPMENT AND
SYSTEMS

- .1 Submit testing, adjusting and balancing reports for mechanical, electrical and building equipment systems.
- .2 Submit Commissioning/Closing Documentation in accordance with Section 01 11 01.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

- 1.1 REFERENCES**
- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .2 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-[1995], Fire Tests of Fire stop Systems.
- 1.2 DEFINITIONS**
- .1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
 - .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
 - .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
 - .4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
 - .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

**1.3 ACTION AND
INFORMATIONAL
SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 11 01 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 11 01 - Shop Drawings and Product Data Sheets.
- .3 Shop Drawings:
 - .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
 - .2 Construction details should accurately reflect actual job conditions.
- .4 Samples:
 - .1 Submit samples showing actual fire stop material proposed for project.
- .5 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
 - .4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

-
- 1.4 QUALITY ASSURANCE**
- .1 Qualifications:
 - .1 Installer: company specializing in fire stopping installations approved by manufacturer with documented experience.
 - .2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this section, with Departmental Representative and Consultant in accordance with Section 01 11 01 – Scheduling to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- 1.5 DELIVERY, STORAGE AND HANDLING**
- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 11 01 – Materials and Equipment and manufacturer's written instructions.
 - .2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate manufacturer and ULC markings.
 - .2 Storage and Protection:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
 - .3 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 11 01 – Construction and Demolition Waste.

Part 2 Products

- 2.1 MATERIALS**
- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended and conforming to specified special requirements described in PART 3.
 - .2 Fire stop system rating: F- rating.
 - .2 Service penetration assemblies: systems tested to CAN-ULC-S115.
 - .3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.

- .4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .10 Sealants for vertical joints: non-sagging.

Part 3 Execution

- 3.1 MANUFACTURER'S INSTRUCTIONS** .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- 3.2 PREPARATION** .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
- .1.1 Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.
- 3.3 INSTALLATION** .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.
- 3.4 SPECIAL REQUIREMENTS** .1 Location of special requirements for fire stopping and smoke seal materials at openings and penetrations in fire resistant rated assemblies are as follows:
- .1.1 Designed for re-entry, removable at all sleeved openings in floors or walls.
- .2 Install reusable "pillow" or "brick" style devices at all openings larger than 0.8 sq. m. with the exception noted below:
- .1.1 Reusable "pillow" or "brick" style devices are not required at openings larger than 0.8 sq. m. where an area greater than 75% of the opening is obstructed with mechanical ductwork, i.e. a 250mm dia. duct through a 300mm dia. opening.

- .3 1 hr. fire resistance rating except as indicated on drawings.
 - .2 Where opening in fire rated separation is not accessible from one side without disruption to occupied space, i.e. in ceiling space above work areas, in laboratories, etc., fire stopping systems is to be designed and installed consistent with manufacturer's recommendations for one-sided installation.
- 3.5 **SEQUENCES OF OPERATION**
 - .1 Proceed with installation only when submittals have been reviewed by Departmental Representative.
 - .2 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.
 - .3 Mechanical pipe insulation: certified fire stop system component.
 - .4 Ensure pipe insulation installation precedes fire stopping.
- 3.6 **FIELD QUALITY CONTROL**
 - .1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
 - .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- 3.7 **CLEANING**
 - .1 Proceed in accordance with Section 01 11 01 - Cleaning.
 - .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
 - .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.
- 3.8 **SCHEDULE**
 - .1 Fire stop and smoke seal at locations indicated in the attached schedules.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2012, Installation of Air Conditioning and Ventilating Systems.
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S112-10, Standard Method of Fire Test of Fire Damper Assemblies.
 - .2 CAN/ULC-S112.2-07, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.
 - .3 ULC-S505-[1974], Fusible Links for Fire Protection Service.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 11 01.
- .2 Indicate the following:
 - .1 Fire dampers.
 - .2 Operators.
 - .3 Fusible links.
 - .4 Design details of break-away joints.

1.3 CLOSEOUT
SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 11 01.

1.4 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 11 01.
- .2 Provide following:
 - .1 6 fusible links of each type.

1.5 CERTIFICATION
OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

1.6 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 11 01.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

2.1 FIRE DAMPERS

- .1 Fire dampers: arrangement Type A, listed and bear label of ULC, meet requirements of Fire Commissioner of Canada (FCC) and NFPA 90A. Fire damper assemblies to be fire tested in accordance with CAN/ULC-S112.

- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
- .3 Top hinged: multi-blade hinged or interlocking type; sized to maintain maximum duct cross section.
- .4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- .5 40 x 40 x 3 mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.
 - .1 Retaining angle on interior of room should be inverted in order to accommodate the existing grille.
 - .2 Exposed face of retaining angle should not exceed the dimensions of the existing grille.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with NFPA 90A and in accordance with conditions of ULC listing.
- .2 Maintain integrity of fire separation.
- .3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
- .4 Coordinate with installer of firestopping.
- .5 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.
- .6 Install break-away joints of approved design on each side of fire separation.

3.2 SCHEDULE

- .1 Refer to Opening/Penetration schedule for locations and approximate sizes of duct openings.
- .2 All dimensions to be verified by contractor on site.

END OF SECTION

Location	Room No:	Opening/ Penetration No.:	Description	Image No.:		Access	Notes
				Shaft side	Room side		
<p>1. All fire separations are 190mm concrete block unless otherwise noted 2. Not every detail of each opening/penetration is documented or photographed. Contractors are to familiarized themselves with site conditions.</p>							
Research Wing Main Floor							
East Mechanical Shaft	Corridor East Shaft - West end	01	Large T-shaped opening; Top of T: 2200 x 150mm; Bottom of T: 1400 x 600mm; Multiple pipes, both insulated and uninsulated, glass, copper and iron, large insulated duct, metal conduit and loose wires.	Corridor East Shaft West - 1st Floor - 01		Both sides	Restricted access due to mechanical
	Corridor-Central Shaft - West End	01	Large T-shaped opening; Top of T: 2200 x 150mm; Bottom of T: 1400 x 600mm; Multiple pipes, both insulated and uninsulated, copper and iron, metal conduit and loose wires.	Corridor Central Shaft West - 1st Floor - 01		Both sides	Restricted access due to mechanical
	Corridor Central Shaft - East end	01	Large rectangular opening: 1200 x 780mm; Multiple pipes, both insulated and uninsulated, copper and iron, metal conduit and loose wires.	Corridor Central Shaft East - 1st Floor - 01		Both sides	Restricted access due to mechanical
Central Mechanical Shaft		01	200w x 840h opening	R101-01-1		shaft side only	Cut and cap compressed air and vacuum lines already disconnected back 150 inside wall.
		02	400w X 200h X 70d (block removed for electrical panel in laboratory)	R101-02-1		shaft side only	Opening obstructed by electrical conduit and box
		03	660w x 500h duct opening through 190 conc bl	R101-03-1	R101-03-2	Both sides	fire rated damper required
		04	Metal conduit and loose cables through 35mm opening	R101-04-1		shaft side only	
		01	400w X 840h opening	R103-01-1		shaft side only	
		02	600w X 200h X 70d (block removed for electrical panel in laboratory)	R103-02-1		shaft side only	
		03	660w x 500h duct opening	R103-03-1	R103-03-2	Both sides	fire rated damper required
		01	400w X 840h opening	R105-01-1		shaft side only	
		02	400w X 200h X 70d (block removed for electrical panel in laboratory)	R105-02-1		shaft side only	
		03	660w x 500h duct opening	R105-03-1	R105-03-2	Both sides	fire rated damper required
	04	250mm conduit through			Both sides		
	05	50 mm conduit			Both sides		
	06	200mm duct			Both sides		
	07	50mm metal conduit			Both sides		
	08	75mm glass drain			Both sides		
				R105-04-05-06-1			
				R105-06-07-1			
				R105-08-1			

Location	Room No:	Opening/ Penetration No.:	Description	Image No.:		Access	Notes
				Shaft side	Room side		
R107		01	400w X 840h opening	R107-01-1		shaft side only	
		02	400w X 200h X 70d (block removed for electrical panel in laboratory)	R107-02-1		shaft side only	
		03	660w x 500h duct opening	R107-03-1	R107-03-2	Both sides	fire rated damper required
		04	300mm fume food duct	R107-04-1	R107-04-2	Both sides	
		05	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R107-05-1		shaft side only	
R109		01	400w X 840h opening	R109-01-1		shaft side only	
		02	600w X 200h X 70d (block removed for electrical panel in laboratory)	R109-02-1		shaft side only	
		03	660w x 500h duct opening	R109-03-1	R109-03-2	Both sides	fire rated damper required
		04	300mm round duct opening	R109-04-1	R109-04-2	Both sides	
R111		01	400w X 840h opening	R111-01-1		shaft side only	
		02	400w X 200h X 70d (block removed for electrical panel in laboratory)	R111-02-1		shaft side only	
		03	660w x 500h duct opening	R111-03-1	R111-03-2	Both sides	fire rated damper required
		04	300mm duct opening	R111-04-05-1	R111-04-05-2	Both sides	
		05	75mm glass drain	R111-01-1		Both sides	
R113		01	400w X 840h opening	R113-01-1		shaft side only	
		02	400w X 200h X 70d (block removed for electrical panel in laboratory)	R113-02-1		shaft side only	
		03	660w x 500h duct opening	R113-03-1	R113-03-2	Both sides	fire rated damper required
		04	300mm spiral fume hood duct	R113-04-1	R113-04-2	Both sides	
R115		01	400w X 840h opening	R115-01-1		shaft side only	
		02	400w X 200h X 70d (block removed for electrical panel in laboratory)	R115-02-1		shaft side only	
		03	660w x 500h duct opening	R115-03-1	R115-03-2	Both sides	fire rated damper required
		04	75mm glass drain pipe	R115-04-1	R115-04-2	Both sides	
		05	300mm duct opening	R115-05-1	R115-05-2	Both sides	
R117		01	400w X 840h opening	R117-01-1		shaft side only	
		02	400w X 200h X 70d (block removed for electrical panel in laboratory)	R117-02-1		shaft side only	
		03	660w x 500h duct opening	R117-03-1	R117-03-2	Both sides	fire rated damper required
		04	300mm duct opening	R117-04-1	R117-04-2	Both sides	
		05	400mm opening	R117-05-06-1	R117-05-06-2	Both sides	
		06	75mm glass drain pipe	R117-01-1		shaft side only	
R119		01	400w X 840h opening	R119-01-1		shaft side only	
		02	400w X 200h X 70d (block removed for electrical panel in laboratory)	R119-02-1		shaft side only	
		03	660w x 500h duct opening	R119-03-1	R119-03-2	Both sides	fire rated damper required
		04	200w x 840h opening	R119-04-1	R119-05-2	shaft side only	
		05	75mm glass drain pipe	R119-05-1	R119-05-2	Both sides	
		06	Multiple loose cables and metal conduit	R119-06-1	R119-06-2	Both sides	

Location	Room No:	Opening/ Penetration No.:	Description	Image No.:		Access	Notes		
				Shaft side	Room side				
Central Mechanical Shaft	123	01	200w x 840h opening	R123-01-1		shaft side only			
		02	200w x 840h opening	R123-02-1		shaft side only			
		03	660w x 500h duct opening	R123-03-1		Both sides	fire rated damper required		
		04	75mm glass drain pipe and loose wire		R123-04-1		Both sides		
	151A	01	200w x 840h opening	R151A-01-1			shaft side only		
		02	400w X 200h X 70d (block removed for electrical panel in	R151A-02-1			shaft side only		
		03	660w x 500h duct opening	R151A-03-1	R151A-03-2		Both sides	fire rated damper required	
		04	200mm ø and 300mm ø ducts, insulated	R151A-04-1 (from below) R151A-04-2 (from above)			shaft side only		
	Central Mechanical Shaft	151C	01	400w X 840h opening	R151C-01-1		shaft side only		
			02	300mm ø duct	R151C-02-1 (from left above) R151C-02-2 (from right above)		shaft side only		
		153	01	400w X 840h opening	R153-01-1			shaft side only	
			02	400w X 840h opening	R153-02-1			shaft side only	
03			400w X 200h X 70d (block removed for electrical panel in laboratory)	R153-03-1			shaft side only		
04			400w X 200h X 70d (block removed for electrical panel in laboratory)	R153-04-1			shaft side only		
05			660w x 500h duct opening	R153-05-1	R153-05-2		both sides	fire rated damper required	
06			2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R153-06-1	R153-06-2		shaft side only		
07			Multiple loose cables and metal conduit	R153-07-1	R153-07-2		both sides		
08			2 - 65mm metal conduit	R153-08-1	R153-08-2		both sides		
09			~200mm ø insulated duct	R153-09-1	R153-09-2		both sides		
10			50mm ø metal conduit	R153-10-1	R153-10-2		both sides		
11	300mm ø duct	R153-11-1	R153-11-2		both sides				
12	75mm ø glass drain	R153-12-1			both sides				

Location	Room No:	Opening/ Penetration No.:	Description	Image No.:		Access	Notes
				Shaft side	Room side		
Central Mechanical Shaft	157	01	400w X 840h opening	R157-01-1		shaft side only	
		02	400w X 840h opening	R157-02-1		shaft side only	
		03	400w X 200h X 70d (block removed for electrical panel in laboratory)	R157-03-1		shaft side only	
		04	400w X 200h X 70d (block removed for electrical panel in laboratory)	R157-04-1		shaft side only	
	05	660w x 500h duct opening	R157-05-1		both sides	fire rated damper required	
	06	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R157-06-1		shaft side only		
	07	150mm ø opening with loose wires through 190mm conc bl	R157-07-1		both sides		
	08	50mm ø metal conduit	R157-08-1		both sides		
	09	50mm ø metal conduit	R157-09-1		both sides		
	10	75mm ø glass drain	R157-10-1		both sides		
	11	300mm ø metal duct	R157-11-1		both sides		
	12	Metal duct (hvac)	R157-12-1		both sides	fire rated damper required	
161	01	400w X 840h opening	R161-01-1		shaft side only		
	02	400w X 200h X 70d (block removed for electrical panel in laboratory)	R161-02-1		shaft side only		
	03	660w x 500h duct opening	R161-03-1		both sides	fire rated damper required	
	04	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R161-04-1		shaft side only		
	05	300mm ø metal duct	R161-05-1		both sides		
	01	400w X 840h opening	R163-01-1		shaft side only		
	02	400w X 200h X 70d (block removed for electrical panel in laboratory)	R163-02-1		shaft side only		
163	03	660w x 500h duct opening	R163-03-1		both sides	fire rated damper required	
	04	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R163-04-1		shaft side only		
	05	300mm ø metal duct	R163-05-1		both sides		
	06	75mm ø glass drain	R163-06-1		both sides		
	07	50mm ø metal conduit	R163-07-1		both sides		
	01	400w X 840h opening	R167-01-1		shaft side only		
	02	400w X 840h opening	R167-02-1		shaft side only		
167	03	200w x 840h opening	R167-03-1		shaft side only		
	04	400w X 200h X 70d (block removed for electrical panel in laboratory)	R167-04-1		shaft side only		
	05	400w X 200h X 70d (block removed for electrical panel in laboratory)	R167-05-1		shaft side only		
	06	660w x 500h duct opening	R167-06-1		both sides	fire rated damper required	
	07	660w x 500h duct opening	R167-07-1		both sides	fire rated damper required	

Location	Room No:	Opening/ Penetration No.:	Description	Image No.:		Access	Notes	
				Shaft side	Room side			
Research Wing Second Floor								
East Mechanical Shaft	Corridor East Shaft West end	01	Irregular opening with insulated and uninsulated ducts, conduit, loose cabling; dampers required in ducts.	Corridor East Shaft West - 2nd Floor - 01		both sides		
		01	50 x 200mm opening	Corridor Central Shaft West - 2nd		both sides		
		02	3 metal conduit and loose cabling	Corridor Central Shaft West - 2nd Floor-03		both sides		
		03	150mm ø opening	Corridor Central Shaft West - 2nd Floor-04		both sides		
Central Mechanical Shaft	Corridor Central Shaft - West End	04	Multiple copper pipes, 10mm and 20mm; damper required in exhaust duct	Corridor Central Shaft West - 2nd Floor-04		both sides		
		01	2200mm x ~300mm opening with multiple ducts, pipes, conduit, and loose cabling	Corridor Central Shaft East - 2nd Floor		both sides		
		01	200w x 840h opening	R203-01-1		shaft side only		
		02	400w X 840h opening	R203-02-1		shaft side only		
	R203	Corridor Central Shaft East end	03	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R203-03-1		shaft side only	
			04	780w x 500h duct opening	R203-04-1	R203-04-05-2	both sides	fire rated damper required
			05	400w x 300h duct opening	R203-05-1		both sides	fire rated damper required
			06	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R203-06-1	R203-06-2	shaft side only	
			07	Insulated pipe through irregular opening	Could not get image through floor grating	R203-07-2	both sides	
			08	Opening in conc bl at top of wall and beam		R203-08-2	both sides	
		09	5 - 25mm metal conduit		R203-09-2	both sides		
		10	50mm metal conduit through		R203-10-2	both sides		

Location	Room No.	Opening/ Penetration No.:	Description	Image No.:		Access	Notes	
				Shaft side	Room side			
Central Mechanical Shaft	R207	01	400w X 840h opening	R207-01-1		shaft side only		
		02	400w X 840h opening	R207-02-1		shaft side only		
		03	400w X 840h opening	R207-03-1		shaft side only		
		04	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R207-04-1		shaft side only		
		05	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R207-05-1		shaft side only		
		06	900w x 500h duct opening	R207-06-1		both sides	fire rated damper required	
		07	900w x 500h duct opening	R207-07-1		both sides	fire rated damper required	
		08	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R207-08-1		shaft side only		
		09	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R207-09-1		shaft side only		
		10	300mm exhaust duct through floor slab			R207-10-2	both sides	
		11	3 - 25mm metal conduit and loose cabling			R207-11-2	both sides	
		12	600mm x 200mm opening /w 300mm Ø exhaust duct and loose cabling		Could not get image through floor grating	R207-12-2	both sides	
		13	300mm Ø exhaust duct			R207-13-2	both sides	
		14	4 - 25mm metal conduit			R207-14-2	both sides	
		15	300mm Ø plastic exhaust duct through irregular opening			R207-15-2	both sides	
R211	01	400w X 840h opening	R211-01-1		shaft side only			
	02	400w X 840h opening	R211-02-1		shaft side only			
	03	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R211-03-1		shaft side only			
	04	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R211-04-1		shaft side only			
	05	800w x 500h duct opening	R211-05-1		both sides	fire rated damper required		
	06	800w x 500h duct opening	R211-06-1		both sides	fire rated damper required		
	07	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R211-07-1		shaft side only			
	08	3 - 25mm metal conduit and loose cabling			R211-08-2	both sides		
	09	300mmØ metal exhaust duct and loose cabling through opening		Could not get image through floor grating	R211-09-2	both sides		
	10	Insulated pipe through 125mm iron sleeve			R211-10-2	both sides		
	11	300mmØ (irregular) opening			R211-11-2	both sides		
	12	300mmØ metal exhaust duct through sleeved opening			R211-12-2	both sides		

Location	Room No:	Opening/ Penetration No.:	Description	Image No.:		Access	Notes
				Shaft side	Room side		
Central Mechanical Shaft	R215	01	400w X 840h opening	R215-01-1		shaft side only	
		02	400w X 840h opening	R215-02-1		shaft side only	
		03	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R215-03-1		shaft side only	
		04	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R215-04-1			
		05	900w x 500h duct opening	R215-05-1	R215-05-06-2	both sides	fire rated damper required
		06	900w x 500h duct opening	R215-06-1		both sides	fire rated damper required
		07	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R211-07-1		shaft side only	
		08	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R215-08-1		shaft side only	
		09	300mmØ metal exhaust duct		R215-09-2	both sides	
		10	300mmØ metal exhaust duct		R215-10-2	both sides	
		11	Insulated pipe and metal conduit through irregular opening in 190 conc bl		R215-11-2	both sides	
Central Mechanical Shaft	R219	12	Sheet metal over 300mmØ opening		R215-12-2	both sides	
		01	400w X 840h opening	R219-01-1		shaft side only	
		02	200w x 840h opening	R219-02-1		shaft side only	
		03	2 - metal conduit and loose cabling		R219-03-2	both sides	
		01	200w x 840h opening	R223-01-1		shaft side only	
		02	200w x 840h opening	R223-02-1		shaft side only	
		03	660w x 500h duct opening	R223-03-1	R223-03-2	both sides	fire rated damper required
		04	65mm hole through 190 conc bl with loose cabling - north wall	R223-04-1		shaft side only	
		05	Insulated pipe - south wall	R223-05-1		shaft side only	
		06	Insulated pipe		R223-06-2	both sides	
		07	400mm x 200mm opening with pipe, metal conduit and loose cabling		R223-07-2	both sides	
08	Irregular opening with 300mm exhaust duct and loose cabling		R223-08-2	both sides			

Location	Room No:	Opening/ Penetration No.:	Description	Image No.:		Access	Notes	
				Shaft side	Room side			
Central Mechanical Shaft	R253	01	200w x 840h opening	R253-01-1		shaft side only		
		02	400w X 840h opening	R253-02-1		shaft side only		
		03	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R253-03-1		shaft side only		
		04	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R253-04-1		shaft side only		
		05	660w x 500h duct opening	R253-05-1		both sides	fire rated damper required	
		06	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R253-06-1		shaft side only		
		07	opening in conc bl at top of wall in multiple locations			R253-07-2	both sides	
		08				R253-08-2	both sides	
		09				R253-09-2	both sides	
		10	300mm x 200mm opening /w multiple metal conduits			R253-10-2	both sides	
		11	300mmØ fume food duct		Could not get image through floor grating	R253-11-2	both sides	
		12	300mmØ insulated fume food duct			R253-12-2	both sides	
		13	2 - 65mmØ PVC conduit			R253-13-2	both sides	
		14	300mmØ fume food duct			R253-14-2	both sides	
		15	300mmØ fume food duct			R253-15-2	both sides	
R257	01	400w X 840h opening		R257-01-1		shaft side only		
	02	660w x 380h duct opening		R257-02-1		both sides	fire rated damper required	
	03	2 - 65mmØ metal conduit; 1 - loose cabling		Could not get image through floor grating	R257-03-2			
	04	BX through block			R257-04-2			
R259A	01	400w X 840h opening		R259A-01-1		shaft side only		
	02	~400w X 200h X 70d (block removed for electrical panel in laboratory)		R259A-02-1		shaft side only		
	03	660w x 500h duct opening		R259A-03-1		both sides	fire rated damper required	
R259B	04			Could not get image through floor grating	R259A-04-2		(image not available)	
	01	400w X 840h opening		R259B-01-1				

Location	Room No:	Opening/ Penetration No.:	Description	Image No.:		Access	Notes
				Shaft side	Room side		
Central Mechanical Shaft	R265	01	400w X 840h opening	R265-01-1		shaft side only	
		02	400w X 840h opening	R265-02-1		shaft side only	
		03	400w X 840h opening	R265-03-1		shaft side only	
		04	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R265-04-1		shaft side only	
		05	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R265-05-1		shaft side only	
		06	800w x 500h duct opening	R265-06-1		both sides	fire rated damper required
		07	800w x 500h duct opening	R265-07-1		both sides	fire rated damper required
		08	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R265-08-1		shaft side only	
		09	1 - 400 x 200mm opening /w metal conduit and insulated piping			both sides	
		10	100 x 100mm irregular opening /w 50mmØ metal conduit			both sides	
		11	100 x 100mm irregular opening /w 2 metal conduit			both sides	
		12	Irregular opening /w 300mmØ fume food duct, 100mmØ sleeved drain pipe, metal conduit and loose cabling		Could not get image through floor grating	both sides	
	13	300mmØ sleeved opening with loose cabling			both sides		
	14	300mmØ fume hood duct through floor slab to penthouse above.			both sides		
R271	01	400w X 840h opening	R271-01-1		shaft side only		
	02	400w X 840h opening	R271-02-1		shaft side only		
	03	200w x 840h opening	R271-03-1		shaft side only		
	04	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R271-04-1		shaft side only		
	05	~400w X 200h X 70d (block removed for electrical panel in laboratory)	R271-05-1		shaft side only		
	06	800w x 500h duct opening	R271-06-1		both sides	fire rated damper required	
	07	800w x 500h duct opening	R271-07-1		both sides	fire rated damper required	
	08	2 - 650mm x 825 (total 1650mm) high galvanized panels on 75 x 75 steel angle	R271-08-1		shaft side only		
	09	300mmØ fume hood duct through floor slab to penthouse above.					
	10	Large irregular opening with 150mmØ drain pipe, metal conduit and loose cabling		Could not get image through floor grating			
	11	Small opening with metal conduit					
	12	2 - Insulated piping					

Location	Room No:	Opening/ Penetration No.:	Description	Image No.:		Access	Notes
				Shaft side	Room side		
Penthouse K	K-West	01	430 x 150mm opening in 120mm poured floor slab	K-W-01		penthouse side only	This penetration go from the descending shaft of Penthouse K - West to above the bulkhead in the library. The openings are photographed from the corridor side of the second floor. The shaft is accessible, however difficult.
		02	430 x 150mm opening in 120mm poured floor slab 2 - 65mmØ metal conduit	K-W-02			
		03	100mmØ pipe through metal sleeve		K-W-03	both sides but restricted	
		04	430 x 150mm opening in 120mm poured floor slab		K-W-04	both sides but restricted	
Penthouse D	K-East	01	430 x 150mm opening in 120mm poured floor slab			penthouse side only	
		01	Irregular opening /w ~300mmØ metal duct	D-01-1	D-01-2	both sides	
		02	5 - insulated copper pipe through poured conc on metal deck	D-02-1	D-02-2	both sides	
		03	2 - copper pipes through poured conc on metal deck	D-03-1	D-03-2	both sides	
		04	760 X 150mm opening in poured concrete on metal deck	D-04-1		penthouse only	
		05	200 x 150mm opening in poured concrete on metal deck	D-05-06-1		partial access from underside	
		06	200 x 150mm opening in poured concrete on metal deck	D-05-06-1	D-06-2	both sides	
		07	400 x 150mm opening in poured concrete on metal deck	D-07-1	D-07-2		
		08	150mmØ opening in poured conc on metal deck	D-08-1		penthouse only	
		09	800 X 150mm opening in poured concrete on metal deck	D-09-1		penthouse only	
		10	800 X 150mm opening in poured concrete on metal deck	D-10-1		penthouse only	
11	Irregular opening /w ~300mmØ metal duct	D-11-1		penthouse only			

Location	Room No:	Opening/ Penetration No.:	Description	Image No.:		Access	Notes
				Shaft side	Room side		
Penthouse L		01	110mmØ metal sleeve through poured conc and metal deck	L-01-1	L-05-2 is representative of the underside of the Penthouse 'L' floor.	both sides	Note that access to underside of penthouse floor is over growth chambers
		02	110mmØ metal sleeve through poured conc and metal deck	L-02-1		both sides	
		03	50mmØ metal sleeve through poured concrete on metal deck	L-03-04-1	L-05-2 is representative of the underside of the Penthouse 'L' floor.	both sides	
		04	50mmØ metal sleeve through poured concrete on metal deck	L-03-04-1		both sides	
		05	2 - metal conduit through 110mmØ metal sleeve through poured conc and metal deck	I-05-1	L-05-2	both sides	
		06	50mmØ metal sleeve through poured concrete on metal deck	L-06-2	L-05-2 is representative of the underside of the Penthouse 'L' floor.	both sides	
		07	300 x 200mm irregular opening with 2 - 75mmØ metal conduits	I-07-1		L-07-2	both sides
		08	50mmØ metal sleeve through poured concrete on metal deck	I-08-1	L-08-2	both sides	
		09	50mmØ metal sleeve through poured concrete on metal deck	L-09-1	L-05-2 is representative of the underside of the Penthouse 'L' floor.	both sides	
		10	2 - metal conduit through 110mmØ metal sleeve through poured conc and metal deck	L-10-1		both sides	
		11	50mmØ metal sleeve through poured concrete on metal deck	L-11-1	L-12-2	both sides	
		12	2 - metal conduit through 110mmØ metal sleeve through poured conc and metal deck	L-12-1		both sides	
		13	50mmØ metal sleeve through poured concrete on metal deck	L-13-14-1	L-05-2 is representative of the underside of the Penthouse 'L' floor.	both sides	
		14	50mmØ metal sleeve through poured concrete on metal deck	L-13-14-1		both sides	
		15	110mmØ metal sleeve through poured conc and metal deck	L-15-16-1	L-05-2 is representative of the underside of the Penthouse 'L' floor.	both sides	
		16	50mmØ metal sleeve through poured concrete on metal deck	L-15-16-1		both sides	
		17	multiple 25mm metal conduit through 110mmØ metal sleeve through poured conc and metal deck	L-17-1	L-05-2 is representative of the underside of the Penthouse 'L' floor.	both sides	
		18	110mmØ metal sleeve through poured conc and metal deck	L-18-1		both sides	
		19	110mmØ metal sleeve through poured conc and metal deck	L-19-1	L-05-2 is representative of the underside of the Penthouse 'L' floor.	both sides	
		20	multiple copper pipes through 110mmØ metal sleeve through poured conc and metal deck	L-20-1		both sides	
		21	replace existing caulking around 400 x 400 metal duct	L-21-1	L-05-2 is representative of the underside of the Penthouse 'L' floor.	both sides	
		22	400 x 150mm opening in poured concrete on metal deck /w multiple conduits	L-22-23-1		both sides	

Location	Room No:	Opening/ Penetration No.:	Description	Image No.:		Access	Notes
				Shaft side	Room side		
		23	400 x 150mm opening in poured concrete on metal deck /w multiple conduits	L-22-23-1		both sides	