

PART E

SPECIFICATIONS

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS, STANDARD DETAILS AND DRAWINGS

- E1.1 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.
- E1.1.1 *The City of Winnipeg Standard Construction Specifications* is available in Adobe Acrobat (.pdf) format on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at <http://www.winnipeg.ca/matmgt>.
- E1.1.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.
- E1.1.3 Further to GC:2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.
- E1.2 The following Drawings are applicable to the Work:

<u>Drawing No.</u>	<u>Drawing</u>
A-1	Second Floor Demolition Plan

ASBESTOS ABATEMENT – TYPE 3

E2. GENERAL & RELATED WORK

- E2.1 Site Conditions identifies the location and Asbestos content of all known Asbestos-containing materials (ACM) to be disturbed by the Work of this Contract. The information provided is for general reference only.
- E2.2 This section shall govern over all Work of the Contract which will, or may, disturb ACMs or surfaces or materials which may have been or become contaminated by ACM either during or prior to Work of this Contract.
- E2.3 It is the intent that Work performed as per this section will result in the removal of all ACM and the decontamination of all surfaces or materials which may have been or become contaminated by ACM either during or prior to the Work of this Contract.

E3. OUTLINE OF WORK

- E3.1 Supply all labour, material, plant and equipment necessary to safely execute and complete all Work of this contract.
- E3.2 Visit the Site prior to Bid Opportunity close to confirm the location and extent of any Asbestos-containing or Asbestos-contaminated materials.
- E3.3 Protect surfaces, building fabrics and items remaining within the Asbestos Work Area.
- E3.4 Protect and maintain electrical, mechanical and other services passing through the Asbestos Work Area required to maintain such services in Occupied Areas. Isolate and protect remaining services. Failure to maintain designated services may result in serious disruption of The City of Winnipeg's operations.
- E3.5 Isolate the Work Area from adjoining spaces through the installation of specified hoardings, seals and enclosures at the perimeter of each phase or Work area.

- E3.6 Construct Worker and Waste Decontamination Facilities at the perimeter of each phase or Work area.
- E3.7 Remove and dispose of ceilings throughout the Second Floor of the building.
- E3.8 Remove, clean and replace at completion of Work, non-operating mechanical and electrical equipment, ducting, building components, materials or items removed to accommodate Asbestos removal.
- E3.9 Perform selective demolition of mechanical and electrical equipment, building components, materials and items scheduled for demolition at locations required to facilitate Asbestos removal.
- E3.10 Remove and dispose of as Asbestos-containing waste, building components, materials and items contaminated by Asbestos that cannot be effectively cleaned.
- E3.11 Encapsulate remaining ACMs at locations where removal is deemed impractical by the Contract Administrator. Encapsulation will not be permitted where removal of building materials or structures scheduled for demolition will facilitate access to the Asbestos materials in question.
- E3.12 Remove and dispose of spray or trowel applied fireproofing present on the beams and structural deck and columns throughout the Second floor of the building. Include encapsulated materials, overspray, debris, fallout and settled dust from other surfaces or from within chases, cavities or shafts.
- E3.13 Notwithstanding the above, spray or trowel applied fireproofing present behind tyndal stone column enclosures is to remain.
- E3.14 Remove and dispose of pipewrap insulation on straight runs and fittings of mechanical services present within a Type 3 enclosure. Include fallen or dislodged debris and material present throughout the Work area.
- E3.15 Remove and dispose of the following as Asbestos-containing waste:
- (a) Plaster or drywall ceilings, lay-in or interlocking acoustic tile or other ceiling systems, including associated items, grids, supports, hangers, furring and tracking.
 - (b) Plaster, masonry or glazed walls and partitions which currently extend above existing ceiling and are scheduled for demolition at locations specified and/or identified on drawings.
 - (c) Electrical equipment and services, light fixtures, BX cable, conduit, wiring, receptacles, speakers and associated items, equipment, tracking, supports and hangers scheduled for demolition within the ceiling space at locations specified and/or identified on drawings.
 - (d) Flexible and rigid ductwork, air diffusers, air boots, associated insulation and other such items, equipment, tracking, supports and hangers from the diffuser back to the mixing box or main branch of the duct.
 - (e) Non-Asbestos debris and rubble present throughout all areas of Work that can not be successfully segregated from Asbestos-containing or contaminated materials.
- E3.16 Remove mixing boxes, clean and turn over to Contract Administrator.
- E3.17 Handling, removal, clean-up or repair of ACMs or surfaces contaminated with Asbestos is to be performed following wet removal techniques. except at locations adjacent to high voltage lines, live steam lines, etc., where the use of water may result in a hazardous condition for the workers. Do not commence Work at such locations without notifying the Contract Administrator in writing. Complete removal at such locations as specified in E29. Dry Removal of Asbestos.

- E3.18 Hoardings used to separate the Work area from Occupied Areas, are to remain in place until completion of Work in the area by other trades or until directed by the Contract Administrator.
- E3.19 Final clean Work area to remove visible signs of Asbestos, other debris or settled dust.
- E3.20 Perimeter seals installed within the electrical closets are to remain in place upon completion of the Work.
- E3.21 Apply lock-down agent to exposed surfaces throughout the Work area, and to surfaces from which any Asbestos had been removed.

E4. SITE CONDITIONS

- E4.1 Sprayed or trowel applied fireproofing present at the following locations is known to contain Amosite Asbestos:
 - (a) Structural steel beams, columns, joists throughout the entire Second Floor.
 - (b) Floor decking throughout the entire Second Floor.
- E4.2 Pipewrap insulation present on straight runs and fittings of mechanical services located throughout the Work area is to be treated, handled and disposed of as ACM.
- E4.3 Interior surfaces of the building's HVAC system, associated ducting, equipment, air handling units, plenums, internal insulation, etc., present at locations throughout the building is known to contain or be contaminated with Asbestos.
- E4.4 Surfaces of plaster or drywall ceilings, acoustic tile, or other ceiling systems, associated tracking and support systems are known to contain or be contaminated with Asbestos.
- E4.5 Surfaces of electrical and mechanical services, building components and associated items, etc., present at locations above existing ceilings, beneath or adjacent to spray or trowel applied ACMs is known to contain or be contaminated with Asbestos. Include with the above, wood, masonry or glazed walls, partitions and/or column enclosures which currently extend above existing ceiling systems.
- E4.6 Immediately stop Work in the area and notify the Contract Administrator should unexpected materials, or materials suspected of containing Asbestos be encountered. Do not resume Work in the area until it has been determined if the material encountered contains Asbestos, and authorization to resume Work is given.

E5. REGULATIONS

- E5.1 Comply with Federal, Provincial, and local requirements, provided that in any case of conflict among those requirements or with these specifications, the more stringent requirements shall apply. Work shall be performed under regulations in effect at the time Work is performed.

E6. QUALITY ASSURANCE

- E6.1 Removal and handling of Asbestos-containing or contaminated materials is to be performed by persons trained in the methods, procedures and industry practices for Asbestos Abatement.
- E6.2 Ensure Work proceeds to schedule, meeting all requirements of this specification.
- E6.3 Complete Work so that at no time airborne dust, visible debris, or water runoff contaminate areas outside the Asbestos Work Area.

E6.4 Any contamination of surrounding area (indicated by visual inspection or air monitoring) shall necessitate the clean-up of effected area, and in the same manner applicable to an Asbestos Work Area at no cost to the City of Winnipeg.

E6.5 All Work of this section involving electrical, mechanical, carpentry, glazing, etc., shall be performed by licensed persons experienced and qualified for the Work required.

E7. INSPECTION

E7.1 From commencement of Work until completion of clean-up operations, the Contract Administrator's Representative is empowered by the Contract Administrator to inspect for compliance with the requirements of governing authorities, adherence to specified procedures and materials, and to inspect for final cleanliness and completion.

E7.2 The Contract Administrator's representative is empowered by the Contract Administrator to order a shutdown of Work when leakage of Asbestos from the controlled Work area has occurred or is likely to occur.

E7.3 Any deviation from the requirements of the specifications or governing authorities that is not approved in writing may result in a stoppage of Work, at no cost to the City of Winnipeg.

E7.4 Additional labour or materials expended by the Contractor to rectify unsatisfactory conditions and to provide performance to the level specified shall be at no additional cost to the City of Winnipeg.

E7.5 Inspection and air monitoring performed as a result of Contractor's failure to perform satisfactorily regarding quality, safety, or schedule, shall be back-charged to the Contractor.

E7.6 Facilitate inspection and provide access as necessary. Make good Work disturbed by inspection and testing at no cost to the City of Winnipeg.

E7.7 The following Milestone Inspections are to take place at defined points throughout the abatement operation specific to each phase or Work area:

- (a) Milestone Inspection A - Clean Site Preparation
Inspection of Site preparations and set-up prior to contaminated Work.
- (b) Milestone Inspection B - Contaminated Perimeter Preparation
Inspection of contaminated preparations at perimeter of Asbestos Work Area.
- (c) Milestone Inspection C - Before Bulk Removal
Inspection of the Asbestos Work Area following contaminated Site preparations but prior to start of major Asbestos removal.
- (d) Milestone Inspection D - Visual Clearance
Inspection of the Asbestos Work Area after removal of Asbestos, but prior to application of lock-down agent.
- (e) Milestone Inspection E - Air Monitoring Clearance
Inspection & air monitoring after application of lock-down agent, but prior to removal of polyethylene from within the Asbestos Work Area.
- (f) Milestone Inspection F - Dismantling Inspection
Inspection after removal of polyethylene but prior to dismantling perimeter isolation and decontamination facility.

E7.8 Provide 24 hours written notice to the Contract Administrator of any request for scheduling of milestone inspections or transportation of waste through Occupied Areas.

E7.9 Do not proceed with next phase of Work until written approval of each milestone is received from the Contract Administrator.

E8. AIR MONITORING

E8.1 Air monitoring will be performed using Phase Contrast Microscopy (PCM) following the National Institute for Occupational Safety and Health Method 7400.

E8.2 Co-operate in the collection of air samples, including providing Workers to wear sample pumps for up to full-shift periods. Contractor will be responsible for the cost of testing equipment repairs or resampling resulting from the actions of the Contractor's forces.

E8.3 Results of PCM samples of 0.05 fibres per millilitre of air (fibre/mL) or greater, outside an Asbestos Work Area, will indicate Asbestos contamination of these areas. Respond as follows:

- (a) Suspend Work within the adjoining Asbestos Work Area until written authorization to resume Work has been received from the Contract Administrator.
- (b) Isolate and clean area in the same manner applicable to the Asbestos Work Area.
- (c) Maintain Work area isolation, and repeat clean-up operations until visually inspection and air monitoring results are at a level equal to that specified.
- (d) At the discretion of the Contract Administrator provide additional negative air units at locations specified in response to elevated fibre levels being detected in the Clean Change Room or Occupied Areas.

E8.4 Results of PCM samples in excess of 0.01 fibres per millilitre of air (fibre/mL), collected within the Asbestos Work Area enclosure after the Site has passed a visual inspection, and an acceptable coat of lock-down agent has been applied, will indicate Asbestos contamination of these areas. Respond as follows:

- (a) Maintain Work area isolation and re-clean entire Work area. Then apply another acceptable coat of lock-down agent to exposed surfaces throughout the Work area.
- (b) Repeat above measures until visually inspected and air monitoring results are at a level equal to that specified.

E8.5 Where results of PCM sampling exceed 20.0 fib/mL within a Type 3 Asbestos Work Area respond as follows:

- (a) Immediately stop Work within the Asbestos Work Area.
- (b) Instruct workers to exit the Asbestos Work Area via the Worker Decontamination Facility while observing specified personnel exiting procedures.
- (c) Contractor's forces shall not re-enter the Asbestos Work Area for a period of 8 hours or until authorized by the Asbestos.
- (d) Upon re-entry to the Asbestos Work Area, mist the air, any fallen debris or exposed surfaces with amended water using an airless sprayer.

E8.6 Additional labour or materials expended by the Contractor to rectify unsatisfactory conditions and to provide performance to the level specified shall be at no additional cost to the City of Winnipeg.

E8.7 Cost of additional inspection and sampling performed as a result of elevated fibre levels in areas outside the Asbestos Work Area or from within the work area following completion of Work, will be back charged to the Contractor.

E9. SUPERVISION

- E9.1 Provide on Site for each Work shift, a Shift Superintendent, who has authority regarding all aspects related to manpower, equipment and production.
- E9.2 Acceptance of supervisory personnel is subject to the Contract Administrator.
- E9.3 At all times during Work at risk of disturbing Asbestos, the Shift Superintendent must be on Site. Failure to comply with this requirement will result in a stoppage of all Work, at no cost to the City of Winnipeg.
- E9.4 Replace supervisory personnel, with approved replacements, within three (3) working days of a written request from the Contract Administrator. Contract Administrator reserves the right to request replacement of supervisory personnel without explanation.
- E9.5 Do not replace supervisory personnel without written approval from the Contract Administrator.

E10. NOTIFICATION

- E10.1 Not later than ten (10) days before commencing Work on this project, notify in writing the local office of Manitoba Labour and Immigration, Workplace Safety and Health Division. Provide telephone notification again immediately prior to start of Work.
- E10.2 Notify sanitary landfill site as per local requirements.
- E10.3 Inform all trades on Site of the presence and location of ACMs identified in the contract documents.

E11. SUBMITTALS – PROPOSED SCHEDULE, SHOP DRAWINGS, ETC.

- E11.1 Submit prior to starting Work:
 - (a) Names and credentials of the Shift Superintendent.
 - (b) Proof that supervisory personnel have performed supervisory function on at least five (5) other Asbestos projects of similar size and complexity.
 - (c) Proposed schedule (prepared in chart format) detailing the following:
 - (i) Duration of Site preparation, contaminated preparation, removal, clean-up and Site dismantlement for each phase area.
 - (ii) Proposed average daily Work force and shifting.
 - (d) Shop drawings for each Asbestos Work Area detailing the following:
 - (i) Location of Waste and Worker Decontamination Facilities.
 - (ii) Any proposed deviation from specifications, procedures, or drawings.
 - (iii) Installation of negative air discharge panels.
 - (e) Documentation including test results, fire and flammability data, samples, and Material Safety Data Sheets for chemicals or materials used in the course of the Asbestos Abatement project including or not limited to:
 - (i) Encapsulants.
 - (ii) Wetting agents.
 - (iii) Lock-down agent.
 - (iv) Rip-proof polyethylene.
 - (v) Polyurethane foam.
 - (vi) Chemicals or materials used in the course of Asbestos abatement.

- (f) Negative air unit performance data and results of DOP tests as required.
- (g) Proof that all employees have been fit-tested for the respirator appropriate for the Work being performed.
- (h) Proof that all employees have had instruction on hazards of Asbestos exposure, use of respirator and all aspects of Work procedures and protective measures.
- (i) Proof that all employees are listed on an Asbestos Work report and have been given required medical examinations.
- (j) Pre-removal survey of damage in all areas where Asbestos abatement Work will take place or waste will be transported.
- (k) Copy of notification to governing authorities of commencement of Work.

E11.2 Submit completed Waste Manifest forms at completion of Work.

E12. WORKER PROTECTION

E12.1 General

- (a) Instruct workers before allowing entry to the Asbestos Work Area. Instruction shall include training in use of respirators, dress, showering, entry and exiting from an Asbestos Work Area, and all other aspects of Work procedures and protective measures.
- (b) Workers shall not eat, drink, smoke or chew gum or tobacco except in established locations outside the Asbestos Work Area.
- (c) Workers shall be fully protected at all times when possibility of disturbance of Asbestos exists.
- (d) Provide and post at access points to the Asbestos Work Area, the procedures described under Worker Protection.

E12.2 Respiratory Protection

- (a) During wet removal and cleaning of Asbestos-containing or contaminated materials within a Type 3 enclosure, supply and use at a minimum, full face-piece powered air purifying positive pressure dust respirators with HEPA filters.
- (b) During dry removal, or if fibre levels within the Work enclosure exceeds permissible levels for use of PAPR during wet removal, supply and use Type C, pressure demand supplied air respirators with full face-piece and egress filters. Ensure workers exiting the enclosure do not disconnect their respirators from supply air hose until they have entered the shower stall.
- (c) During Site teardown, supply and use negative pressure non-powered half-face respirators equipped with HEPA cartridge filters.
- (d) Workers applying polyurethane foam shall wear full face respirators with organic vapour cartridges. Dispose of cartridges after each shift.
- (e) Provide and ensure the use of respiratory equipment appropriate for the Work being performed for persons who are required to enter the Asbestos Work Area.
- (f) Respiratory protective devices shall be certified by the National Institute of Occupational Safety and Health (NIOSH) or other testing agency acceptable to governing authorities.
- (g) Maintain respiratory equipment in proper functioning and clean condition or remove from Site.
- (h) Respiratory equipment shall be identified with permanent markings with current list of persons utilizing such equipment displayed in a clean area on Site.

- (i) Filters used shall be tested following each use in accordance with manufacturer's specifications or replaced at the following minimum frequency:
 - (i) Replace cartridge filters for negative pressure respirator every 16 hours of wear unless tested on-Site.
 - (ii) Replace PAPR cartridge filters every 8 hours of wear unless tested on Site.
 - (iii) Mark filters for rotation and regular replacement. Once worn in an Asbestos Work Area filters may not be removed from the project Site except for disposal.
- (j) Ensure that no person required to enter an Asbestos Work Area has facial hair which affects the seal between respirator and face.
- (k) Store respirators, and tested filters that will be reused, in an established clean area on Site. Charge batteries in this area.

E12.3 Protective Clothing and Equipment

- (a) All personnel required to enter the Asbestos Work Area must use disposable full body coveralls with attached head covering. Once coveralls are worn, treat and dispose of as Asbestos-contaminated waste.
- (b) Use hard hats, safety shoes and other protective apparel required by applicable construction safety regulations.

E12.4 Asbestos Abatement Work Area Entry Procedures

- (a) Remove street clothes in Clean Change Room.
- (b) Put on respirator with new or tested filters, coveralls, and head covers in Clean Change Room or clean side of Shower Room.
- (c) Store street clothes, uncontaminated footwear, towels, etc., in Clean Change Room.

E12.5 Asbestos Abatement Work Area Exit Procedures

- (a) Remove gross contamination from protective clothing using a HEPA vacuum or by wet wiping.
- (b) Proceed to Equipment and Access Room and remove all contaminated clothing and equipment except respirator.
- (c) Store contaminated footwear, hard hats, etc., in Equipment and Access Room.
- (d) Proceed naked to showers while still wearing respirator.
- (e) Shower, cleaning outside of respirator with soap and water. Thoroughly wet body, head and hair, remove respirator and wash body, head and hair. Wet clean inside of respirator face-piece.
- (f) Remove filters for testing or dispose of in container provided for this purpose on the clean side of the Shower. Store respirators in this area after leaving the Shower but prior to entering the Clean Change Room.
- (g) Proceed to the Clean Change Room, dry off and dress in street clothing.

E13. VISITOR PROTECTION

- E13.1 Provide clean protective clothing, equipment and approved respirators to Authorized Visitors.
- E13.2 Instruct Authorized Visitors in the use of protective clothing, respirators, and Asbestos Work Area entry and exit procedures.

E13.3 Maintain one (1) emergency access kit (equipped with respirator, protective clothing, etc.) at each access point to Asbestos Work Area for use by Contract Administrator or authorized visitors.

E14. SIGNAGE

E14.1 Work Area Signs: Post signs in both official languages at access points to the Asbestos Work Area. Where possible, provide signage immediately prior to entering Asbestos Work Area but out of public view. Letters on signs shall be in upper case "HELVETICA MEDIUM" and read as follows:

- (a) CAUTION (25 mm high).
- (b) Asbestos Hazard Area (19 mm high).
- (c) Unauthorized Entry Prohibited (19 mm high).
- (d) Wear Assigned Protective Equipment (19 mm high).
- (e) Breathing Asbestos Dust May Cause Serious Bodily Harm (19 mm high).

E14.2 Container Signs: Label containers for the disposal of Asbestos as follows:

- (a) CAUTION CONTAINS ASBESTOS FIBRES (25 mm high).
- (b) Do Not Mishandle (19 mm high).

E15. WASTE AND MATERIAL HANDLING

E15.1 Provide the Contract Administrator with a copy of each completed waste transportation manifest verifying the safe transportation of waste to an authorized disposal Site.

E15.2 Asbestos-containing or contaminated materials removed during the work shall be treated, packaged, transported and disposed of as Asbestos-contaminated waste.

E15.3 Materials that could tear or puncture a 6 mil (0.15mm) polyethylene bag shall be packaged and disposed of in sealed rigid waste containers specified.

E15.4 Redundant non-ACMs, rubble and debris removed during contaminated Work shall be treated, packaged, and disposed of as Asbestos contaminated waste. With written approval of the Contract Administrator, non-porous materials may be cleaned, sprayed with a sealer and disposed of as clean waste.

E15.5 Transportation of all waste and materials through Occupied Areas of the building is limited to quiet hours along predetermined routes and must be covered or placed within unmarked carts. Clean-up waste routes and loading area after each load. Use Asbestos abatement precautions if appropriate or requested by the Contract Administrator or Representative.

E15.6 Garbage bins shall be dropped at designated locations and shall remain covered and enclosed (locked) while at the building Site.

E15.7 Pick-up and drop off of garbage bin(s) shall be at pre-approved times, and must not interfere with building operations.

E16. DIFFERENTIAL PRESSURE MONITORING

E16.1 Provide and install differential pressure monitors at the perimeter of each Asbestos Work Area enclosure at two (2) locations chosen by the Contract Administrator. Replace damaged or non-functional equipment upon discovery.

- E16.2 Record data twice daily during contaminated Work on the standard form.
- E16.3 Maintain specified differential pressure.
- E16.4 Stop contaminated Work and take corrective action if pressure differential drops below the specified level. Notify the Contract Administrator immediately.

E17. RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS

- E17.1 Re-establish objects and items relocated by the Contractor's workforce to facilitate Work.
- E17.2 Re-establish electrical, communication, HVAC and other services previously disconnected or otherwise isolated to accommodate Work by this section.
- E17.3 Make good at completion of Work, all damage not identified in pre-removal survey.

E18. DUMP MONITORING

- E18.1 Co-operate with Ministry of Environment inspectors and immediately carry out instructions for remedial Work at dump, at no additional cost to City of Winnipeg.
- E18.2 Ensure each shipment of containers is accompanied by a Contractor's representative who will supervise dumping of containers and ensure all guidelines and regulations are followed.
- E18.3 Equip each shipment of containers with full personal protective equipment and tools required to properly clean-up spilled Asbestos in the case of a failure in an Asbestos Waste Container.

PRODUCTS AND FACILITIES

E19. MATERIALS AND EQUIPMENT

- E19.1 Materials and equipment must be in good condition and free of Asbestos, Asbestos debris, and fibrous materials. Disposable items must be of new materials only.
- E19.2 Asbestos Waste Container: Impermeable container acceptable to Ministry of the Environment and disposal Site. Labelled as required, comprised of the following:
 - (a) A sealed 6 mil (0.15 mm) polyethylene bag, inside a second 6 mil (0.15 mm) sealed polyethylene bag.
 - (b) A sealed 6 mil (0.15 mm) polyethylene bag, positioned inside or outside a rigid sealed container of sufficient strength to prevent perforation of the container during filling, transportation and disposal.
- E19.3 Differential Pressure Monitor: Acceptable Product: Magnehelic gauge (Cat. No. 2000-00) manufactured by Dwyer Instruments Inc. Available through E. H. Price Ltd., 638 Raleigh Street, Winnipeg, Manitoba.
- E19.4 Ground Fault Panel: Electrical panel equipped as follows:
 - (a) Ground fault circuit interrupters of sufficient capacity to power temporary electrical equipment and lights in Asbestos Work Area.
 - (b) Interrupters to have a 5 mA ground fault protection.
 - (c) Necessary accessories including main switch disconnect, ground fault interrupter lights, test switch to ensure unit is working, and reset switch.
 - (d) Openings sealed to prevent moisture or dust penetration.

- E19.5 HEPA Vacuum: Vacuum with necessary fittings, tools and attachments. Discharged air must pass through a HEPA filter.
- E19.6 Lock-down Agent: Sealant for purpose of trapping residual dust and shall be capable of withstanding surface temperature of substrate. Product must be compatible with replacement materials and must have flame spread & smoke development ratings of less than 50 and shall leave no stain when dry. Acceptable product: Serpiflex Shield or approved equal.
- E19.7 Negative Air Exhaust Ducting (Flexible): Airtight tubing with metal reinforcement or approved equal. Mechanically affixed each exhaust duct to the unit's exhaust with metal hose clamp. Diameter of duct to equal negative air discharge. Acceptable product: Thermalflex S-LP 10 flexible ducting as manufactured by Flexible Technologies.
- E19.8 Negative Air Unit: Portable air handling system which extracts air directly from the Asbestos Work Area and discharges air to exterior of building. Equipped as follows:
- Pre-filter and HEPA filter. Air must pass HEPA filter before discharge.
 - Pressure differential gauge to monitor filter loading.
 - Auto shut off and warning system for HEPA filter failure.
 - Separate hold down clamps to retain HEPA filter in place during change of pre-filter.
- E19.9 Polyethylene Sheeting: 6 mil (0.15 mm) minimum thickness, unless otherwise specified, in sheet size to minimize joints.
- E19.10 Polyurethane Foam: Slow expanding **one** component foamed-in place polyurethane rigid insulation. Foam must have acceptable fire and smoke development ratings or be removed at completion of Work.
- E19.11 Protective Coveralls: Disposable full body coveralls complete with hoods. Acceptable material: Tyvek coveralls or approved equal.
- E19.12 Rip-Proof Polyethylene Sheeting: 8 mil (0.20 mm) fabric made up from 5 mil (0.13 mm) weave and two (2) layers of 1.5 mil (0.05 mm) poly laminate or approved equal. In sheet size to minimize on-Site seams and overlaps.
- E19.13 Shower Hose: Water lines for supply of hot & cold water to shower facilities to be rated for use at 200 psi (1380 kPa) or twice the working pressure whichever is greater. Supply lines to be continuous and free of fittings, joints or couplings. Acceptable Product: No. 71-92 Daco; as available from MacMor Industries, Winnipeg, Manitoba.
- E19.14 Sprayer: Airless sprayer capable of providing a fine mist or spray while maintaining sufficient velocity to penetrate surface of ACM through to substrate without blowing loose the material as it is being wetted.
- E19.15 Wetting Agent: Non-sudzing surface active agent. Acceptable product: Aqua-Gro or approved equal.

E20. HOARDING WALLS

- E20.1 Walls separating an Asbestos Work Area from an Occupied Area or another Work area shall be constructed as follows:
- Lower Perimeter Hoarding Wall: 2" x 4" (50 mm x 100 mm) wood or metal studs at 16" (400 mm) o/c with continuous sill and top plate, covered with one (1) layer of polyethylene sheeting on each side of wall. Install 1/2" (12 mm) plywood over exterior polyethylene where wall is exposed to Occupied Areas. Use good-one-side 1/2" (13 mm) paint plywood

(minimum two (2) coats) at locations where exposed to non-construction areas. Colour of paint to be selected by the Contract Administrator.

- (b) Upper Perimeter Hoarding Wall - 2" x 4" (50 mm x 100 mm) wood or metal studs at 16" (400 mm) o/c with continuous sill and top plate, covered with two (2) layers of polyethylene sheeting on Work area side. Frame to be anchored to underside of structure and extend down to top of ceiling or top of wall/hoarding wall at Site perimeter. This wall shall be constructed so as to remain intact when the wall below is removed. Install wall under contaminated conditions. Use rip-proof polyethylene at locations where exposed to non-construction areas.
- (c) Exterior Hoarding Wall - Construct as per lower perimeter hoarding wall using exterior grade painted plywood (colour of paint to be selected by Contract Administrator) and insulate wall cavity with R 12 fibreglass batt insulation.

E21. DECONTAMINATION FACILITIES

E21.1 Workers' Decontamination Facility: A decontamination facility comprised of four (4) linked rooms, an Equipment and Access Room, a Shower Room, a Respirator Storage Room, and a Clean Change Room. Rooms, Occupied Areas and Asbestos Work Areas, shall be separated by curtained doorways at each door.

E21.2 Equipment and Access Room: Room between Shower Room and Asbestos Work Area. Minimum requirements as follows:

- (a) Waste receptor for contaminated clothing or equipment not to be reused.
- (b) Storage facilities for any personal protective equipment to be reused in Asbestos Work Areas.
- (c) Minimum size of 48 square feet (4.5square metres).

E21.3 Shower Room: Room between Respirator Storage Room and Equipment and Access Room. Minimum requirements as follows:

- (a) One (1) walk through shower unit for every six (6) workers.
- (b) Provide a constant supply of hot and cold water, controllable at each shower. Water supply must be sufficient to provide water at a minimum temperature of 40°C (maximum 50°C) in a volume required for all workers to properly decontaminate.
- (c) Terminate water supply runs at individual hot and cold shut-off valves located on clean side of Shower Room. Connect shower to these valves.
- (d) Provide sump pumps, sufficient for volume of waste water being discharged from showers and drip pans. Direct waste shower water to sanitary sewer drains.
- (e) Provide power switch adjacent to each shower for operating sump pumps.
- (f) Provide soap, shampoo and clean towels to workers and authorized visitors.

E21.4 Respirator Storage Room: Room between the Shower Room and the Clean Change Room. Minimum requirements as follows:

- (a) Install ground faulted power supply, hooks and shelves on clean side of shower for storage of respirators and recharging of batteries as required.
- (b) Provide 6 mil poly waste container for disposal of respirator cartridge filters.
- (c) Minimum room size of 48 square feet (4.5 square metres).

E21.5 Clean Room: Room between the Respirator Storage Room and Occupied Areas. Minimum requirements as follows:

- (a) Provide lockers or hangers for workers' street clothes and personal belongings.
- (b) Provide and install a vented wood door in wood frame at doorway to Occupied Area. Door must have locking passage. Provide three (3) keys to the Contract Administrator.
- (c) Provide and install temporary water heater for showers where required.
- (d) Minimum size of 64 square feet (5.9 square metres).

E21.6 Waste and Equipment Decontamination Facility: Waste and Equipment Decontamination Facility comprised of three (3) linked rooms: a Container Cleaning Room, a Holding Room and a Transfer Room. Purpose of this system is to provide a means to decontaminate drums, scaffolding, Asbestos waste containers, vacuum, spray equipment, other tools, equipment and materials required in the Asbestos Work Area. Rooms, Occupied Areas and Asbestos Work Areas, shall be separated by curtained doorways at each door.

E21.7 Container Cleaning Room: Room between Asbestos Work Area and Holding Room of sufficient size to allow proper washing of equipment and waste containers or double-bagging of Asbestos waste. All wash water shall be treated as Asbestos-contaminated waste. Minimum size of 48 square feet (4.5 square metres).

E21.8 Holding Room: Room between Container Cleaning Room and Transfer Room, of sufficient size to accommodate at least two (2) rigid waste containers or largest item of equipment used. Minimum size of 48 square feet (4.5 square metres).

E21.9 Transfer Room: Room between Holding Room and Occupied Area, acting as an airlock for the transfer of waste. At doorway to Occupied Area, provide and install a vented wood door in wood frame. Door must have locking passage set or hasp and lock. Provide three (3) keys to the Contract Administrator. Minimum size of 48 square feet (4.5 square metres).

E22. CONSTRUCTION OF DECONTAMINATION FACILITIES

E22.1 Floor:

- (a) Lay one (1) sheet of rip-proof polyethylene over floor area that will be covered by decontamination facility prior to erecting wall framing.
- (b) Turn 24" (600 mm) of rip-proof polyethylene up the outside of the decontamination facility and overlap with the polyethylene sheeting covering the exterior perimeter wall.
- (c) In the Container Clean Room, Equipment and Access Room, Holding Room, Transfer Room, Respirator Storage Room, and Clean Room, cover floor with a second layer of rip-proof polyethylene overlapped and sealed to the polyethylene sheeting on the walls.
- (d) In Shower Room, provide a 40" (1000 mm) wide x 108" (2700 mm) long x 6" (150 mm) deep sealed drip pan below shower stall and extending 36" (900 mm) into Shower Room on both sides of the shower stall. Install a wooden duck-board walking surface over drip pan on both sides of the shower stall.
- (e) In the Container Clean Room, provide a 6" (150 mm) deep sealed drip pan of sufficient size to allow proper washing of equipment and waste containers while containing all wash water. Cover drip pan with duck-board walking surface.

E22.2 Perimeter Walls:

- (a) 2" x 4" (50 mm x 100 mm) wood framing at 16" (400 mm) o/c with continuous top and sill plates.
- (b) Cover interior of wall with one (1) layer of polyethylene sheeting.
- (c) Install 1/2" (13 mm) plywood sheeting over lower 48" (1200 mm) of interior polyethylene sheeting in Waste and Equipment Decontamination Facility.

- (d) For perimeter walls exposed to Asbestos Work Area, cover exterior of framing with 1/2" (13 mm) plywood sheathing caulked and sealed at joints then cover plywood with one (1) layer rip-proof polyethylene.
- (e) For perimeter walls exposed to the Occupied Area, install a layer of polyethylene directly over the framing, and cover with 1/2" (13 mm) plywood sheathing. Use good-one-side 1/2" (13 mm) painted plywood (minimum two (2) coats) at locations where exposed to non-construction areas. Colour of paint to be selected by the Contract Administrator.

E22.3 Interior Walls:

- (a) Construct walls to separate the rooms of the decontamination facilities using 2" x 4" (50 mm x 100 mm) wood framing at 24" (600 mm) o/c with continuous top and sill plates.
- (b) Cover walls with one (1) layer of polyethylene sheathing on each side. Install 1/2" (13 mm) plywood sheathing over rip-proof polyethylene sheathing on lower 48" (1200 mm) of the Waste and Equipment Decontamination Facility.

E22.4 Roof:

- (a) Size of joists is to be determined by span. For spans up to 10 feet (3.3 meters) use as a minimum 2" x 6" (50 mm x 150 mm) wood joist at 16" (400 mm) o/c with continuous 2" x 6" (50 mm x 150 mm) headers.
- (b) Where roof is exposed to the Asbestos Work Area, cover joists with 3/4" (20 mm) plywood sheathing, caulked and taped at all joints. Cover plywood with two (2) layers of rip-proof polyethylene. One (1) layer to extend continuously over rip-proof polyethylene on the perimeter walls.
- (c) Where roof is exposed to the Occupied Area, install a layer of polyethylene directly over joists. Cover polyethylene with good-one-side 1/2" (13 mm) painted plywood (minimum two (2) coats) at locations where roof of facility is visible to building occupants in non-construction areas. Colour of paint to be selected by the Contract Administrator.
- (d) At underside of joist install one (1) layer of polyethylene.
- (e) Minimum interior clear height 6' - 6" (2.0 m) to underside of joist.

E22.5 Curtained Doorway:

- (a) Install two (2) flap doors, full width and height of door opening at all doors between chambers, facilities and Asbestos Work Area.
- (b) Construct each flap door of two (2) layers of rip-proof polyethylene sheathing with all edges tape reinforced. Use wood strapping to securely fasten flap doors to head and alternate jambs.
- (c) Weight each flap to ensure automatic closure.
- (d) Provide direction arrows on flaps to indicate opening.

E23. EXECUTION

E23.1 Clean Site Preparation

- (a) Moving of equipment, tools, supplies, and stored materials which can be performed without disturbing ACMs will be performed by others.
- (b) Erect hoarding walls between Asbestos Work Area and Occupied Areas.
- (c) Pre-clean all surfaces using HEPA vacuum or damp cloth prior to installing protection.
- (d) Erect Worker and Waste Decontamination Facilities at locations approved by the Contract Administrator.

- (e) Pressure test water supply lines to the decontamination facilities in place using compressed air methods. Lines must be tested at a minimum of 200 psi (1380 kPa) or twice the working pressure whichever is greater. Test must confirm lines as having maintained specified pressure with no significant drop having occurred over a period of not less than 1 hour as witnessed by the Contract Administrator.
- (f) Provide one (1) specified ground fault electrical panel for each 1,000 square feet (300 square metres) of Asbestos Work Area. All electrical apparatus including temporary heating equipment shall be supplied from a ground fault system. Ensure safe installation of electrical lines and equipment by skilled tradesmen.
- (g) Install temporary lighting in all Work areas at levels that will provide for a safe and efficient use of the Work area - minimum 550 LUX.
- (h) Where Site Conditions permit the isolation of existing power supply within the Asbestos Work Area without disturbance of Asbestos ensure existing power supply to Work area is isolated at panel, tagged, disconnected or grounded where necessary. Power supply to remaining areas of building must not be disrupted during Work of this Section.
- (i) Maintain fire alarms, sensors and detectors operational. Provide necessary protection without hampering the detection ability of this system.
- (j) Establish negative pressure within the Asbestos Work Areas as follows:
- (k) Provide negative air units in place sufficient to maintain specified airflow and pressure differential between contaminated Asbestos Work Area and Occupied Areas.
- (l) Distribute negative air units evenly throughout Site.
 - (i) Provide weighted flaps in perimeter seal to provide make-up air.
 - (ii) Operate negative pressure units continuously from completion of Clean Site Preparation until start of final dismantlement.
 - (iii) Replace pre-filters frequently to maintain specified flow.
 - (iv) Replace HEPA filter as required to maintain flow rate and integrity of unit.
 - (v) Install and make airtight all negative air discharge ducting. Use rigid sheet metal ductwork in Occupied Areas (painted in non-construction areas). Colour of paint to be selected by Contract Administrator.
 - (vi) Install in-line booster fans along the length of discharge ducting wherever Site conditions require negative air unit discharge to be directed over distances greater than 12 m (40 ft). Position booster fans so as to avoid any disruption to operations in Occupied Areas.
 - (vii) Leak test in place using DOP Method, negative pressure units which discharge directly into Occupied Areas.
 - (viii) Discharge into Occupied Areas only with written approval of the Contract Administrator.
- (m) Install negative air discharge panels as follows:
 - (i) Remove existing windows or doorways where necessary and replace with a 3/4" (18 mm) painted plywood panel (colour to match frame).
 - (ii) Install panel securely in window or door frame and make weather-tight with caulking (colour to match frame).
 - (iii) For each negative pressure unit, provide a 12" (300 mm) diameter, screened, duct opening through panel.
 - (iv) Provide exterior ducting as required to ensure negative air units do not discharge within 5 metres of building access points in use by building occupants or fresh air intakes. Direct discharge away from building access points or fresh air intakes.
 - (v) Reinstall windows or doorways upon completion of Work.
 - (vi) Submit shop drawing for conditions encountered.

- (n) Independently seal below ceiling openings to Work area using polyethylene, tape, caulking, polyurethane foam, etc., including but not limited to windows, doors, vents, diffusers, etc.
- (o) Seal openings in floor using plugs, tape, caulking, rip-proof polyethylene, etc.. Floor openings are to be sealed independently prior to installation of floor polyethylene. Include floors of duct and service shafts.
- (p) Pre-clean with HEPA vacuum and make watertight all electrical trenches and headers located in floor of Work area using caulking and tape. Cover entire plate or panel with two (2) layers of independently sealed rip-proof polyethylene. Install so as to overlap plate or panel edges by minimum of 6".
- (q) Maintain emergency and fire exits from Asbestos Work Area, or establish alternative exits satisfactory to Provincial Fire Marshall and local authorities having jurisdiction. Maintain extra routes from Occupied Areas. Place emergency exit signs at locations so as to clearly mark exit route. Seal emergency exit door so as not to impede use of door during emergency evacuation.
- (r) Install battery powered emergency lights so as to:
 - (i) Light exit routes through Asbestos Work Area.
 - (ii) Light worker emergency exits from Asbestos Work Area.
 - (iii) Provide lighting throughout Asbestos Work Area upon loss of power to Ground Fault Panel.
- (s) Provide a fire extinguisher at each emergency exit in the decontamination facilities. Protect extinguishers with polyethylene in a manner that will not hamper use in an emergency.
- (t) Install polyethylene and plywood so as to protect surfaces in the Asbestos Work Area that may be damaged. Carefully protect finishes that are scheduled to remain in place.
- (u) Install minimum two (2) layers of rip-proof polyethylene (independently sealed) on floor surfaces. Extend floor protection a minimum of 12" (300 mm) up all vertical surfaces in the Work area.
- (v) On existing Work area walls forming the perimeter of the building, install one (1) layer of rip-proof polyethylene.
- (w) On existing Work area walls adjacent to Occupied Areas, install two (2) layers of independently supported polyethylene.
- (x) Install one (1) layer polyethylene on interior walls within the Work area and exterior perimeter walls of the building.
- (y) At junction of floor and wall surface overlap floor polyethylene with wall polyethylene by a minimum of 150 mm at each layer. One (1) layer of wall polyethylene must always overlap the top layer of floor polyethylene.
- (z) For hoarding walls exposed to the Asbestos Work Area; install polyethylene as specified in Paragraph 2.2 - Hoarding Walls.
- (aa) Stagger or offset seams of polyethylene wherever multiple layers are used and ensure each layer is independently sealed.
- (bb) Provide required tools, equipment, vacuums and Asbestos waste receptacles within the Asbestos Work Area.
- (cc) Post required signs at all access points to the sealed Asbestos Work Area.
- (dd) Schedule and obtain written approval of Milestone A (Clean Site Preparation) before proceeding.

E24. CONTAMINATED PERIMETER PREPARATION

- E24.1 Where Site preparations as outlined in Paragraph 3.1 above may result in the disturbance of Asbestos or Asbestos contaminated materials, complete this Work (Contaminated Perimeter Preparation) during Quiet Hours after shutting down HVAC systems affecting the Work area.
- E24.2 Proceed with Contaminated Perimeter Preparation while utilizing full personal protective procedures and equipment, amended water and HEPA vacuums.
- E24.3 Prior to commencement of, and throughout Contaminated Perimeter Preparation, complete frequent smoke testing to ensure air movement at perimeter of the Work area and at service shafts, etc., is flowing inward into the Asbestos Work Area.
- E24.4 If smoke testing indicates there is insufficient air movement, stop Work and immediately notify the Contract Administrator.
- E24.5 Provide additional negative air units as required to ensure proper air flow.
- E24.6 Repeatedly mist the air throughout the performance of this Work while maintaining surfaces within the Asbestos Work Area in a damp state.
- E24.7 Remove sections of tile, plaster or drywall ceilings, grids or other obstructions to access ducts, shafts and perimeter decking, to complete required isolation, seals and/or installation of hoarding walls.
- E24.8 Remove ceilings in sections equal to the Work that can be performed in one shift.
- E24.9 Isolate HVAC or exhaust systems which terminate within the Asbestos Work Area as follows:
- (a) Isolate ductwork as close as possible to perimeter of Asbestos Work Area.
 - (b) Cap ducts with metal of gauge equal to sheet metal being capped.
 - (c) Seal seams of cap with duct sealant, tape and polyethylene sheeting.
 - (d) Seal openings in dormant ductwork using polyethylene and tape.
 - (e) If ducts are to be reactivated, smoke test seal immediately upon system reactivation. Reseal and retest as required.
- E24.10 Where required to install Upper Perimeter Hoarding to complete isolation proceed as follows:
- (a) Drape polyethylene drop sheet a minimum of 36" (915 mm) out over ceiling tiles at perimeter of Asbestos Work Area beneath line of removal.
 - (b) At locations where sprayed or trowel applied materials are present saturate and remove a line of Asbestos 12" (300 mm) wide from surface of deck and beams.
 - (c) Remove Asbestos following wet removal techniques and place directly into waste container. Do not allow material removed to fall to the floor.
 - (d) Use HEPA vacuum at all times adjacent to point of removal and for cleaning.
 - (e) Install hoarding progressively as Work advances.
- E24.11 Isolate and identify remaining electrical and communication systems within the Asbestos Work Area. Systems and services required to remain live are to be clearly tagged LIVE by the Contractor's qualified electrician.
- E24.12 Seal holes in existing perimeter walls, columns, deck, etc. exposed by removal of ceiling at perimeter of Asbestos Work Area.

- E24.13 Cover perimeter walls, shafts, etc. adjacent to Occupied Areas exposed by removal of ceilings at perimeter of Asbestos Work Area with two (2) layers polyethylene. Cover other perimeter and interior walls with one (1) layer of polyethylene.
- E24.14 Schedule and obtain written approval of Milestone Inspection B (Contaminated Perimeter Preparation) before proceeding.

E25. CONTAMINATED SITE PREPARATION

- E25.1 Repeatedly mist the air throughout the performance of this Work while maintaining surfaces within the Asbestos Work Area in a damp state.
- E25.2 Isolate HVAC or exhaust systems which are required to remain active within or through the Asbestos Work Area as follows:
- (a) Isolate systems that remain active during quiet hours while systems are deactivated.
 - (b) Clean outside of duct and fully seal outside of duct or equipment using duct sealant, tape and two (2) layers rip-proof polyethylene so as to make air tight.
 - (c) Cap opening in duct present in the Asbestos Work Area using metal of gauge equal to sheet metal being capped. Seal seams of cap with duct sealant, tape and polyethylene sheeting so as to make air tight.
 - (d) Smoke test seals regularly and maintain.
 - (e) Include in this preparation all ductwork and equipment presently insulated with Asbestos-containing products.
- E25.3 Maintain fire alarms, sensors and detectors operational. Provide necessary protection without hampering the detection ability of this system.
- E25.4 Remove or protect remaining equipment or surface mounted fixtures scheduled to be reused or turned over to the Asbestos which could not be completed previously without the disturbance of ACM.
- E25.5 Remove remaining drywall, tile, plaster or other ceiling systems including associated items, grids, supports, hangers, furring and tracking. Cut hangers back to within 15 mm of clip or insert.
- E25.6 Seal holes or penetrations in deck, shafts, walls, columns, ducts, etc. when exposed by ceiling removal.
- E25.7 Temporarily support existing electrical, communication and mechanical services, temporary lighting and items previously supported by the ceiling systems.
- E25.8 Pre-clean then protect in place using polyethylene and tape remaining mechanical equipment, ducting and piping scheduled to remain that can not be readily cleaned following completion of Work.
- E25.9 Protect electrical and communication systems, etc. scheduled to remain with polyethylene and tape. Include all communication, coaxial, triaxial, fire and public address systems, wiring, conduit, speakers, heat and smoke detectors, alarms, lights, equipment and instrumentation including junction boxes, speakers, thermostats, etc.
- E25.10 Ensure protection of pneumatic control lines located in Asbestos Work Area. Notify Contract Administrator if lines are damaged prior to or during Work of this section.

- E25.11 Following isolation and identification of electrical and communication systems, remove electrical equipment, services, light fixtures, BX cable, conduit, wiring, receptacles, speakers and associated items, equipment, tracking, supports and hangers scheduled for demolition.
- E25.12 Remove mechanical equipment and services, flexible and rigid ductwork, air diffusers, mixing boxes, air boots, associated insulation and other such items, equipment, tracking, supports and hangers scheduled for demolition.
- E25.13 Remove and dispose of localized sections of walls, partitions and bulkheads scheduled for demolition at locations required to facilitate access for Asbestos removal. Include with the above, top course (400 mm) of hollow and solid masonry walls within the Asbestos Work Area scheduled to remain.
- E25.14 Sequence the above Work at times approved by the Contract Administrator. Do not demolish any existing walls that form the perimeter of the Asbestos Work Area without the expressed written permission of the Contract Administrator.
- E25.15 Schedule and obtain written approval of Milestone Inspection C (Before Bulk Removal) before proceeding.

E26. MAINTENANCE OF CONTAMINATED ASBESTOS WORK AREA

- E26.1 Maintain enclosures in tidy condition and free of dislodged Asbestos or other debris.
- E26.2 Ensure Asbestos Abatement Work Area enclosures, barriers, and polyethylene linings are effectively sealed and taped. Repair damage and remedy defects immediately.
- E26.3 Visually inspect enclosures at beginning and end of each working period. Inspection must be performed by overall superintendent or shift superintendent.
- E26.4 Inspect negative air units including discharge ducting at beginning and end of shift.

E27. MAINTENANCE OF DECONTAMINATION FACILITIES

- E27.1 Maintain access to decontamination facilities in a locked state when not being used for worker access, egress, or waste and equipment movement.
- E27.2 Maintain and clean decontamination facilities at the following frequency:
- (a) Thoroughly clean Worker Decontamination Facility at beginning and end of each shift change.
 - (b) Clean Equipment and Waste Facility on a frequent basis during waste or equipment removal and at the completion of each shift.
- E27.3 Visually inspect decontamination facilities at beginning and end of each working shift. Inspection must be performed by overall supervisor or shift supervisor.

E28. WET REMOVAL OF ASBESTOS

- E28.1 Proceed with selective demolition of mechanical and electrical equipment, building components, materials and items scheduled for demolition at locations required to facilitate access to concealed Asbestos-containing materials.
- E28.2 Ensure any non-Asbestos debris or rubble generated during this selective demolition is removed from the immediate area prior to commencement of any Asbestos removal.

- E28.3 This Section shall remain responsible for the clean-up and disposal of all debris or rubble not able to be successfully segregated from Asbestos-containing or contaminated materials during the selective demolition as completed by this Section.
- E28.4 In areas of wet removal of spray or trowel applied material, spray Asbestos with amended water using airless spray equipment. Saturate Asbestos to prevent release of airborne fibres during removal. Fully saturated Asbestos may be scraped directly into waste containers or may be allowed to fall to floor.
- E28.5 Remove Asbestos-containing mechanical insulation scheduled for removal in layers, while maintaining exposed surfaces of insulation or lagging in a wet condition. Where necessary puncture surface of insulation to thoroughly saturate Asbestos. Full saturation of insulation will not be required if material is immediately bagged and not allowed to fall to floor.
- E28.6 All dislodged debris and fibres shall be maintained in wet state and placed in waste containers for disposal as Work progresses and at the end of each shift.
- E28.7 Repeatedly mist the air throughout the performance of this Work while maintaining surfaces within the Asbestos Work Area in a damp state.
- E28.8 Remove as directed by the Contract Administrator, non-operating mechanical services, ducting, ceiling structures or similar items, obstructions and sections of walls at service shafts, chases and cavities as required to remove Asbestos-containing materials.
- E28.9 Following completion of gross Asbestos removal Work, perform the following:
- (a) Wet clean all surfaces from which Asbestos has been removed with stiff bristle brushes, vacuums, wet-sponges etc. to remove visible residue and fibrous materials.
 - (b) Wet clean all other surfaces in the Asbestos Work Area, including the decontamination facilities, equipment, surfaces of polyethylene sheeting, floor and walls surfaces, ducts and similar items not covered with polyethylene sheeting.
 - (c) Remove all wash water as contaminated waste.
 - (d) Repeat final cleaning procedures until the Work area is at a standard of cleanliness acceptable to the Contract Administrator.
- E28.10 As Work progresses, and at regular intervals, transport sealed and labelled Asbestos waste containers from the Asbestos Work Area to an authorized waste disposal Site.
- E28.11 Remove and dispose of as Asbestos-contaminated waste the pre-filters from all negative air units.
- E28.12 Schedule and obtain written approval of Milestone D (Visual Clearance) before proceeding.

E29. DRY REMOVAL OF ASBESTOS

- E29.1 At Site locations where the use of wet removal methods may result in a hazardous condition to Contractor's personnel or may risk damage to City of Winnipeg's property, dry removal methods are to be used. Do not commence Work at such locations without notifying the Contract Administrator in writing.
- E29.2 Where required to complete both wet and dry removal Work within the same Work area, schedule dry removal Work in advance of wet removal Work.
- E29.3 Other than as specified below, all preparation and general procedures for wet removal apply.
- E29.4 Cleaning hose or wands, tools, etc., shall be non-conductive.

- E29.5 Live cables that are to be disturbed or relocated shall be handled using non-conductive protective gloves, under the direction of a qualified electrician.
- E29.6 Any scaffolding or platform to be used shall be grounded to the building ground bus or nearest cable tray ground bus at least two (2) grounding points using minimum #2/70 copper insulated wire.
- E29.7 Perform cleaning using dry methods. Do not use water or lock-down agent except where approved or instructed to by the Contract Administrator.
- E29.8 Control dust levels within dry removal Work areas as follows:
- (a) Add water to Asbestos waste containers to saturate waste prior to sealing container.
 - (b) Wherever possible and without jeopardizing worker safety, repeatedly mist the air throughout the removal process while maintaining non-conductive surfaces within the Asbestos Work Area in a damp state.
- E29.9 Schedule and obtain written approval of Milestone Inspection D (Visual Clearance) before proceeding.

E30. WASTE AND MATERIAL HANDLING

- E30.1 Removal of waste containers and decontaminated equipment and materials from the Asbestos Work Area shall be performed using the waste decontamination facility as follows:
- (a) Prior to entering the waste decontamination facility Container Cleaning Room, the first worker (fully protected inside the Asbestos Work Area) shall remove any visible gross Asbestos contamination from the surface of the item being removed from the Asbestos Work Area.
 - (b) The first worker then passes the item to a second worker located in the Container Cleaning Room. The second worker then wet sponges, cleans, double bags and/or wraps and seals the item prior to passing the item through the curtained doorway to a third worker in the Holding Room. (The second and third worker shall be fully protected with respirator and disposable clothing and may only leave the decontamination facility via the Asbestos Work Area.)
 - (c) Without entering the Transfer Room, the third worker then passes the item through the curtained doorway to a fourth worker located within the Transfer Room.
 - (d) The fourth worker then removes the item from the Transfer Room and transports it to the disposal bin. (The fourth worker must never enter the Holding Room.)

E31. APPLICATION OF LOCK-DOWN AGENT

- E31.1 Obtain the Contract Administrator's written authorization to proceed prior to applying lock-down agent.
- E31.2 Paint surfaces from which Asbestos-containing material has been removed with a heavy coat (two (2) passes) of lock-down agent.
- E31.3 Apply one (1) coat of lock-down agent as required to cover all other surfaces in the Asbestos Work Area, including all polyethylene and surfaces scheduled for demolition.
- E31.4 Restrict access to Asbestos Work Area and operate negative air units for a 12 hour period prior to Milestone Inspection E (Air Monitoring Clearance).
- E31.5 Schedule and obtain written approval of Milestone E (Air Monitoring Clearance) before proceeding.

E32. ASBESTOS WORK AREA TEARDOWN AND DISMANTLING

E32.1 Teardown

- (a) Continue to restrict access by other trades, unauthorized personnel, etc., to the Asbestos Work Area, until approval of Milestone Inspection F (Dismantling Inspection) is obtained.
- (b) Maintain perimeter seals, decontamination facilities and negative air unit(s) fully functional until approval of Milestone Inspection F (Dismantling Inspection) is obtained.
- (c) Ensure use of half-face respirators with high efficiency filters and disposable clothing, during teardown and removal of Asbestos contaminated polyethylene, tape, foam pack, caulking and enclosures from Asbestos Work Area.
- (d) Phase the removal of polyethylene, tape, polyurethane foam, caulking and enclosures from the Asbestos Work Area so as to maintain perimeter isolation as long as possible.
- (e) Remove polyethylene sheeting from wall and floor surfaces by rolling it inwardly onto itself.
- (f) While removing the top layer of polyethylene sheeting from surfaces protected by two (2) layers of polyethylene sheeting, cut the lower layer of polyethylene sheeting so as to expose the baseboards, window sills, cabinets, shelves and other horizontal surfaces that may be contaminated by fallen ACM.
- (g) Visible fibres or residue found during removal of polyethylene shall be immediately removed using a HEPA vacuum or damp cloth.
- (h) Place polyethylene, tape, cleaning material, clothing and other contaminated waste in containers and dispose of as Asbestos waste.

E32.2 Clean up

- (a) Equipment used in contaminated Asbestos Work Area shall be washed to remove Asbestos contamination, or double bagged for transportation prior to being removed from Asbestos Work Areas, via waste and equipment decontamination facility.
- (b) Seal vacuum, hoses and fittings, and all tools used in contaminated Work Site in 6 mil polyethylene bags prior to removal from Work Area.
- (c) Clean-up Asbestos Work Area, decontamination chambers, and all other surfaces that may be contaminated. Remove polyethylene protection from floor surfaces within the decontamination chambers at this time.
- (d) Wash and mop with clean water all surfaces in the Asbestos Work Area.
- (e) Schedule and obtain written approval of Milestone Inspection F (Dismantling Inspection) before proceeding.

E32.3 Dismantling

- (a) Hoarding walls, platforms, scaffolding, tunnels, etc., used to separate Occupied Areas from Asbestos Work Area, are to remain in place until completion of Work in the area by other trades or until authorized to be removed by the Contract Administrator.
- (b) Remove from the area decontamination facilities, temporary lights, ground fault panels, negative pressure units and all other equipment located within the Work area not scheduled to remain.
- (c) Immediately upon shutting down negative air units, seal air inlet grill, ducting and exhaust vent with polyethylene tape. Dispose of unit pre and intermediate filters as Asbestos contaminated waste.
- (d) Damp mop and clean Occupied Areas following completion of dismantlement.

REPLACEMENT FIREPROOFING/THERMAL INSULATION

E33. GENERAL AND RELATED WORK

- E33.1 Read this section in conjunction with all drawings and all other sections so as to comply with the requirements of Division 1 and the General Conditions of the Contract.
- E33.2 Related Work specified elsewhere:
Division 13, Section 13080 Asbestos Abatement - Type 3

E34. OUTLINE OF WORK

- E34.1 Protect surfaces, building fabric and items which remain within the Work area. Make good at completion of Work, all damage not identified prior to commencement of Work.
- E34.2 Provide barriers, seals and partitions at locations required to isolate the Work area from adjoining areas so as to prevent the spread of dust.
- E34.3 Supply all labour, material, plant and equipment necessary for the supply and installation of replacement sprayed or trowel applied fireproofing insulation to surfaces from which Asbestos-containing fireproofing insulation were removed under Work of this contract.
- E34.4 Remove, then later replace at completion of Work, all objects and items as required to facilitate Work of this section.
- E34.5 Include at no additional cost to the City of Winnipeg, items reasonably inferred in accordance with the usages of trade and necessary to good practice.
- E34.6 Final clean of Work area following completion of Work to remove any visible trace of settled dust, debris and excess materials.

E35. SCHEDULE

- E35.1 Complete Work required of this section following the completion of Asbestos related Work within each phase or Work area. Do not apply new materials until the Contract Administrator has inspected completion of Asbestos removal and has provided written authorization to proceed.

E36. QUALIFICATIONS OF APPLICATOR

- E36.1 Applicator must be licensed by manufacturer of materials being applied.
- E36.2 Applicator must have a minimum 3 years application experience.

E37. SUBMITTALS - TEST REPORTS AND RESULTS

- E37.1 Prior to the application of the product submit the following:
- (a) Product data including certified copies of test reports verifying sprayed fireproofing applied to substrate as constructed on project will meet or exceed requirements of Specification.
 - (b) Test results in accordance with ULC S101-1980 for fire endurance and CAN4-S102-M80 for surface burning characteristics.
 - (c) Proposals based on designs using accepted fireproofing design criteria for a two hour fire rating.

- (d) Submitted writing proof of applicator license and experience.

E38. SAMPLES

- E38.1 Submit duplicate 300 x 300 mm size sample of product being applied.

E39. PROTECTION

- E39.1 At outdoor temperatures less than 5 °C, ensure that a 5 °C air and substrate temperature is maintained during and for a minimum 48 hours after application. Ensure that natural ventilation to properly dry the fireproofing insulation during and subsequent to its application is provided. In enclosed areas lacking openings for natural ventilation, ensure that interior air is circulated and exhausted to the exterior of the building.
- E39.2 Provide temporary enclosures, seals and exhaust systems to prevent airborne dust from contaminating air beyond application area.
- E39.3 Protect all surfaces and equipment from damage by overspray, fall-out, water, and dusting of sprayed materials. Include hangers, cables and ceiling components. In lieu of protection clean overspray, fallout and dust from all surfaces where the sprayed material is not required (eg. hangers, cables, lights, ducts, etc.).

E40. INSPECTION AND TESTING

- E40.1 Inspection and testing of sprayed fire-proofing will be carried out by Testing Laboratory designated by the Contract Administrator.
- E40.2 City of Winnipeg will pay costs for initial testing. Costs for re-testing resulting from deficiencies will be performed at the Contractor's expenses.
- E40.3 In order to determine the field applied thickness and density, the testing regime is based on the requirements ASTM E605-77 testing standards and on standards established by the American Wall and Ceiling Institute Technical (AWCI) Committee No. 4. will be performed according to the following regime:
- (a) Using the structural floor plans as reference, random testing Sites will be selected at the rate of one test site per 10,000 square feet or one test site per change in assembly or assembly rating.
- E40.4 At each test site a series of thickness measurements will be taken on beams, joists, deck profiles, columns or column caps etc. using a thickness gauge manufactured as per ASTM E605-77 by Hydra-Cone Inc. of York, Pennsylvania.

The pattern and frequency of the thickness measurements will be as follows:

- (a) BEAMS AND JOISTS: 11 measurements around the profile of the beam at two locations 12" (300 mm) apart, for a total of 22 measurements, which are used to calculate the average thickness.
- (b) DECK: 25 measurements, taken within a 144 square inch (0.09 square metre) plan area, which are used to calculate the average thickness. Measurements will be taken at flat pan deck, and at the valley, side and crest of corrugated deck.
- (c) ELECTRIFIED DECK: 25 measurements, taken within a 144 square inch (0.09 square metre) plan area, which are used to calculate the average thickness. Measurements will be taken at flat pan deck, and at the valley, side and crest of corrugated deck.

- (d) COLUMNS AND COLUMN CAPS: 12 measurements around the profile of the column at two locations 12" (300 mm) apart, for a total of 24 measurements, which are used to calculate the average thickness.
- (e) DENSITY: For cementitious sprayed fireproofing density results are based on either the weight of wet mix, using the "dixie cup" method, or by dry density testing and weight determination, as per ASTM E605-77. For fibrous and non-fibrous sprayed fireproofing density results are based on dry density testing and weight determination, as per ASTM E605-77.
- (f) VISUAL AND INDIVIDUAL THICKNESS TESTING: To ensure that the test locations are representative of the entire test area, a bay by bay visual inspection of all areas where the spray has been applied will be performed. During this inspection individual thickness measurements will be taken to confirm that the application is consistent. Any visual deficiencies such as damaged material, fallout, and areas of bare steel will be reported.

E40.5 To comply with the ULC/ULI testing methodology, thickness measurements that exceed the test design thickness by more than 3 mm for ULC and 6mm for ULI are capped at the ULC test thickness plus 3 mm and the ULI test thickness plus 6mm. Individual field measurement, for ULC that are 3 mm less than the test thickness, fail automatically and require the application of more fireproofing/thermal insulation. Individual field measurement for ULI that are 6 mm less than the test thickness, fail automatically and require the application of more fireproofing/thermal insulation.

E40.6 The averages of the adjusted field measurements are accurately compared to the measurements listed by the ULC/ULI test designs. Using this comparison, the application will pass or fail. In the case of a failed test result, the Contractor must apply more material must and the regime of testing will be repeated at the Contractor's expense.

PRODUCTS AND FACILITIES

E41. MATERIALS & EQUIPMENT

E41.1 Sprayed fireproofing insulations:

- (a) Type A: Underwriter Laboratory of Canada (ULC) or Underwriters Laboratories Incorporated (ULI) labelled and listed cementitious **Asbestos-free** fireproofing.
- (b) Type B: Underwriter Laboratory of Canada (ULC) or Underwriters Laboratories Incorporated (ULI) labelled and listed fibrous **Asbestos-free** fireproofing.
- (c) Type C: Underwriter Laboratory of Canada (ULC) or Underwriters Laboratories Incorporated (ULI) labelled and listed non-fibrous **Asbestos-free** fireproofing.

E41.2 Sealer: As recommended by fireproofing manufacturer, tested for use with fireproofing/thermal insulation product and ULC/ULI test designs submitted.

E41.3 Adhesive: As recommended by fireproofing manufacturer, tested for use with fireproofing/thermal insulation product and ULC/ULI test designs submitted.

EXECUTION

E42. PREPARATION

E42.1 Inspect and verify in writing that the substrate is free of material which would impair bond.

E42.2 Verify that painted substrate are compatible and have suitable bonding characteristics to receive sprayed fireproofing insulations.

- E42.3 Clean substrate as per the manufactures recommendations if contamination that would impair bond is discovered and remove incompatible materials.
- E42.4 Ensure that items required to penetrate sprayed fireproofing/thermal insulations are placed before installation of fireproofing insulation.
- E42.5 Ensure that new ducts, piping, equipment, or other items which would interfere with application of fireproofing insulation are not positioned until Work of this section is completed.
- E42.6 Ensure that existing ducts, piping equipment or other items which would interfere with the complete application of fireproofing insulation are repositioned or compensated for. Submit proposed changes to the ULC/ULI test design as required by the presence of existing building components.

E43. APPLICATION

- E43.1 Apply approved adhesive to all concrete substrate prior to the application of the sprayed fireproofing insulation.
- E43.2 Apply sprayed fireproofing insulation to correspond with test design or calculations as submitted and approved. Apply sprayed fireproofing insulation so as to provide a two hour fire rating.
- E43.3 Fireproofing must be cellulose based and tinted blue in colour.
- E43.4 Apply sprayed fireproofing insulation over substrate, building up to required thickness to cover substrate with monolithic blanket of uniform density and texture.
- E43.5 Provide, by cutting and scraping or masking, true straight edges at the line where the sprayed fireproofing insulation terminates and other finishes begin.
- E43.6 Board tamp fibrous sprayed products, and apply cementitious products to a medium smooth finish where the product will remain exposed.
- E43.7 Apply sealer to all exposed sprayed fireproofing insulation at a rate of 6.5 square meters per litre.
- E43.8 Water tamp fibrous sprayed fireproofing insulations at locations where product will be concealed.
- E43.9 Apply sealer to all concealed sprayed fireproofing insulation at a rate of 10.0 square metres per litre.

E44. PATCHING

- E44.1 Patch damage to fireproofing insulation caused by testing or Work of other trades before fireproofing insulation is enclosed or concealed.