



BUILDING DEMOLITION AND WASTE TREATMENT SERVICES

TECHNICAL PAPER

Virotec provides an extensive range of building demolition, waste management (including asbestos removal), and solid hazardous waste treatment services across Australia.



INTRODUCTION TO THE SERVICE

Many companies and government agencies throughout Australia inherit disused and derelict building sites. These sites may contain derelict building structures such as factories, concrete slabs and footings, workshops and sheds, storage facilities and hard stand areas, disused and abandoned plant and equipment, underground storage tanks, contaminated soil and other solid waste. Physical materials range from concrete, bricks, steel and timber to asbestos roof sheeting, glass and aluminium windows and fixtures; these materials may or may not be contaminated with any number of possible pollutants, including chemical solvents, volatile organic compounds, heavy metals, acids and alkalis, and various forms of hydrocarbons, including diesel and lubricants, which have spilled, been discarded or have otherwise reached the environment via poor past industrial practices.

Contaminated soil might include different types of clay, sand and topsoils, as well as areas containing rubble and other solid waste, which have been mixed, disposed of, or otherwise left to the elements over many years or even decades. Often derelict or disused industrial sites containing buildings which need demolition (but which are also high-priced assets) cannot be legally sold until all such remediation work has been carried out to the satisfaction of the buyer and local or national regulators.

In addition to providing solutions for hazardous waste and environmental remediation, including the treatment of hazardous industrial solids and on-site contaminated soil treatment, in 2010 Virotec introduced a range of services related to the demolition of disused or derelict industrial buildings, the removal of hazardous waste, such as asbestos and contaminated concrete, and the treatment of the most highly contaminated solid waste, including waste contaminated with lead, arsenic and mercury. These services are provided in conjunction with Virotec's industry partner, McMahon Services of Adelaide, South Australia (www.mcmahon-services.com.au) which has a 30-year track record of success in building demolition.

Typical Project Scope of Work

Building demolition may include a variety of different staged activities depending on the nature the building being demolished and the type of waste treatment to be utilised. However, a typical building demolition and waste treatment program includes the following work. First is the mobilisation of plant, equipment and personnel to site, and the establishment of site facilities, including site office, first aid room, lunch room, toilets and decontamination facility. Areas of contamination for removal are marked on-site, with the removal of asbestos roof sheeting or other asbestos products being a high priority before other work proceeds. The non-contaminated asbestos is typically transferred to a licensed disposal site, with the removal of any contaminated asbestos to lined shipping containers for transport to Virotec's treatment disposal facility.



Cutting steel into smaller, manageable pieces suitable for safe transportation and processing.

Once all asbestos has been removed from the site, the next stage involves the demolition of the building superstructure using a long-reach excavator. The removal of high-level contaminated steel involves cutting the steel to required size, and loading the steel into shipping containers for transport to Virotec's waste treatment facility for processing. Mist sprays are utilised throughout the project to minimise dust release, and all runoff is collected and treated as required by the Environmental Protection Agency (EPA). A wash-down facility is provided at the site to ensure that no contamination from the demolished building leaves the site.

Once the building superstructure has been completed, existing concrete slabs and footings are removed and trammed to a designated crushing lay-down area; any on-site, existing concrete slabs may be used for this purpose to avoid the spread of contamination into surrounding soil.

On completion of slab and footing removal, the excavation and loading of contaminated soil from drains and surrounding areas, particularly soil immediately under the plant building, are carried out. Specified levels of contaminated soil are excavated and loaded directly into lined shipping containers for transfer to Virotec's waste treatment facility (the depth of excavation is determined by the client or by an independent third party to ensure that all contaminated soil is removed from site). The demolition and processing of any underground storage tanks, brine sludge tanks, and/or buried concrete cells or pits are also carried out at this stage.

Once stockpiled, the rubble resulting from excavated concrete tanks and the demolished superstructure is then crushed using a primary jaw crusher; this process creates a <100 mm solid waste product. Steel reinforcement is separated from the rubble at this stage; the crushed material is segregated and sorted prior to loading according to pre-determined levels of contamination, and all higher contaminated materials are progressively loaded into lined shipping containers for transport to Virotec's waste treatment facility for processing.

Many disused industrial sites contain discarded 200 litre drums (with or without contents) and other discarded solid waste. Loading of these drums, including any contaminated dust from the building demolition process, into shipping containers for transport to Virotec's waste treatment facility for processing occurs at this stage.

On completion of the work, the plant is fully decontaminated, and all plant, equipment, shedding and fencing is removed from the site. The site is left in a neat and presentable condition and graded to contour upon completion.

Prior to the commencement of a project, the following tasks are completed:

- > Preparation of all project documentation, including a detailed project risk assessment and method statement, project health and safety plan, and a Safety Environment Management Program (SEMP);



Virotec uses only state-of-the-art, industry-certified, personal protection equipment (PPE), such as that being used in this photo.

- > Application to relevant workplace standards agency for approval to remove any asbestos materials in accordance with all relevant acts and laws;
- > All demolition work is undertaken in full compliance with applicable national or local standards and statutory legislations; for example, all on-site personnel use specialised protective clothing and masks, with access limited to others not directly involved in the demolition; project and
- > Where site-specific regulations or rules apply, prepare an Environmental Effects Report (EER) for demolition of redundant plant and remediation of contaminated solid and liquid wastes.

Example of Typical On-Site Works

Site Preparation

The site is prepared to ensure all steps of the SEMP are addressed. The SEMP includes, but is not limited to, the following actions:

- > Temporary fencing around the “designated work area”;
- > Signage;
- > Siltation control;
- > Dust control; and
- > Storm water control.

Demolition of the Plant.

The demolition of a building includes the dismantling and crushing of all brickwork, slabs, pits, steel work and surrounding structures. Demolition works include the following components:

- > Mobilisation of plant and equipment to site;
- > Provision of temporary fencing to secure the designated work area;
- > Establishment of site facilities, including a site office, first aid room, lunch room, toilets and decontamination facility;
- > Removal of any loose and accessible dust and salt products using a vacuum truck prior to commencement of works;
- > Demolition of entire structure, including footings and underground tanks;
- > On completion of the demolition and removal of the superstructure, the existing slabs and footings are removed, loaded and transported for treatment and disposal, as applicable;
- > Transportation of all waste conforming to local acceptance criteria to landfill;
- > Submit a project notification form and all project methodology and safety documentation to local health and safety regulator prior to commencement of work;



Demolition of a building's superstructure using a 40 tonne excavator.

- > All demolition work is undertaken in full compliance with applicable national and local regulatory standards and statutory legislations; and
- > Provision of all project management, supervision, labour, and plant and equipment to undertake the work.

Asbestos Management

The management, safe removal and disposal of all asbestos products from site is a critical part of Virotec’s building demolition and waste management services. This aspect of the service includes the following:

- > Make application to local regulators for approval to remove asbestos materials in accordance with national and local acts and regulations;
- > Undertake asbestos removal under the relevant “Removal License”;
- > Undertake atmospheric air monitoring, as required, under relevant national and local regulatory regimes, and project asbestos approval notification using an independent air monitoring company approved by local regulators;
- > Package and transport all asbestos waste in accordance with the relevant act or regulation under the “Removal License”; and
- > Dispose asbestos to approved local landfill, which must be EPA licensed to receive and dispose of asbestos materials.



Asbestos sheet removal prior to primary superstructure demolition.

Removal of Concrete Burials

Many disused and derelict plants have concrete burials containing either hazardous or non-hazardous liquid and solid wastes from previous operations which have been buried on-site. Burials may include concrete or steel tanks, which were used for the storage of diesel, petrol or other chemicals. Provision must be made for the excavation, treatment and disposal of the mixed concrete and other liquid and/ or solid wastes which compose these disused burials.



Excavating contaminated soil post superstructure demolition.

Soil Excavation, Segregation and Removal

The SEMP is based on estimated contaminated soil volumes provided to Virotec by the client or other relevant third party. Once the plant superstructure has been removed, and any concrete burials excavated and removed, a pre-designated volume of contaminated soil under the concrete slab of the building is excavated and segregated. It is generally envisaged that the bulk of the soil will be either non- or low-level contaminated soil, and therefore it can be transported to local landfill, with any remaining soil with higher levels of contamination being transported to specially-approved local or regional landfills. This may also involve the interstate transport of waste soil for treatment at one of Virotec’s waste treatment facilities.

On completion of slab and footing removal, the excavation, loading and transport of contaminated soil is carried out. Excavation is normally limited to 3.0 metres in depth, with soil loaded directly into semi tippers and transported for off-site treatment and disposal. Existing site wheel wash facilities are utilised to ensure there is no material “drag out” when trucks exit the site. Trucks are fully tarped when transporting soil.

Site Restoration

On completion, the excavation is back-filled and contoured; at this stage the plant is fully decontaminated and all plant, equipment, shedding and fencing is removed from the site. Allowance may need to be made for re-surfacing of the site depending on local needs and conditions.

Stakeholder Liaison

Virotec regularly liaises with key on-site personnel and with relevant regulators throughout the project. Regular meetings are held with the client contract managers and other relevant personnel, as required. Virotec also liaises with other stakeholders (including the EPA, Workplace Standards, and Community Consultation Committees) as required to ensure a successful outcome of the demolition and treatment project.

EXAMPLE OF TYPICAL OFF-SITE WORKS

Hazardous Waste Treatment and Management



Crushed contaminated concrete and brick rubble (left) and chopped steel (right) loaded into lined shipping containers ready for removal and transportation to Virotec’s waste treatment facility.

Not all waste from the plant and surrounds can necessarily be treated and disposed into local landfills. This may be due, for example, to high total and/or leachable heavy metal concentrations, high levels of acid or alkali materials, high levels of toxic materials, including reactants and flammable materials, and/or high levels of volatile organic compounds (VOCs).

For example, local landfills may accept hazardous solid waste with leachable heavy metals, such as arsenic, lead and mercury, of no more than <0.1 mg/L, irrespective of whether the waste is treated or not. However, leachable levels of heavy metals are typically higher than this level and specially designed landfills with mono-cells designed for safe, long-term storage of treated waste exist, but often not near the demolition site and sometimes not even in the same state. These mono-cells may have acceptance criteria for leachable metals of <1.0 mg/L, or ten times the levels of leachable metals allowed in local landfills. Therefore, this solid waste may need to be transported to Virotec’s treatment facility and treated prior to disposal in mono-cells.



Immediate post-building demolition phase prior to concrete slab and tank removal.

In these cases, Virotec removes and safely transports all such hazardous waste (including any contaminated plant, equipment and soil) to Virotec's hazardous waste treatment facility in Queensland for proper treatment and safe disposal. Such treatment procedures that are required to safely treat and dispose of contaminated solid waste are fully outlined and explained in detail in the SEMP, but typically these include the use of ViroFlow™ Technology and/or ViroSoil™ Technology to bind heavy metals and neutralise acidity, and to completely destroy hydrocarbons, including VOCs.

Volatile organic compounds are organic chemical compounds which exist at specific vapour pressures and which can affect the environment and human health. Volatile organic compounds are numerous, varied, and ubiquitous; although VOCs include both man-made and naturally occurring chemical compounds, it is the anthropogenic or man-made VOCs, such as tetrachloroethylene (also called perchloroethylene or PCE), that are of the greatest concern and which are the most tightly regulated. Volatile organic compounds are typically not acutely toxic, but have chronic effects. Emissions of VOCs, such as benzene and toluene from oil refineries and chemical plants, pose a long-term health risk to workers and local communities.

In situations where large amounts of flammable liquids and gases are contained under pressure, fugitive emissions also increase the risk of fire and explosion; all such compounds must be carefully managed during the demolition process. Volatile organic compounds include aliphatic hydrocarbons, ethyl acetate, glycol ethers, and acetone. Many building materials, such as paints, adhesives, wall boards and ceiling tiles, slowly emit, for example, formaldehyde, which irritates the mucous membranes.



Contaminated demolition waste loaded into treatment pits ready for ViroFlow™ Technology treatment at Virotec's Queensland facility.



Typical underground storage tanks, often containing various types of liquid or solid waste, which require demolition and removal from site.

Some of the health effects caused by exposure to VOCs include eye, nose, and throat irritation, headaches, loss of coordination and nausea, and damage to the liver, kidneys, and central nervous system. Some VOCs cause cancer in animals, and some are suspected or known to cause cancer in humans. The ability of VOCs to cause adverse health effects varies greatly from those that are highly toxic to those with no known health effects. Their complete destruction in Virotec's building demolition and waste treatment service is therefore of the greatest importance to the client and the environment.

OTHER WORK OF CONSIDERATION IN BUILDING DEMOLITION

Site Validation

Virotec offers a complete range of site auditing services, but it is generally the responsibility of the client to contract an independent third party environmental auditor to verify that all contamination has been removed from the site.

Reports

Virotec provides the client with detailed progress reports and a treatment report at the completion of the project. Reports might include sampling and analysis work, and environmental approvals, and are written to satisfy the terms and conditions of the project as specified by the client, the EPA or other relevant government agency.

CONCLUSION

Virotec has a ten-year history of successfully treating some of the most contaminated and hazardous solid wastes in the world. Projects have included the effective treatment of chromium-, mercury-, lead- and arsenic-contaminated filter cakes, sediments and sludges, PCE-, lead- and mercury-contaminated soils, and a wide range of hazardous industrial solid wastes from more than 20 different industrial applications. As a result of its long-term relationship with McMahon Services, Virotec couples this ten-year track record of waste treatment with McMahon's 30-year track record of building demolition to provide its clients with a range of highly professional services which cover all aspects of building demolition and waste treatment.



Contaminated demolition waste being treated with ElectroBind™ reagent at Virotec's Queensland facility.



Treated demolition waste being loaded into semi tippers for transport to disposal site.