Sent:	22/05/2022 5:10:39 PM
Subject:	DA2022/0662 63-67 The Corso Manly - SKERRETT Objection
Attachments:	Lot 3 Sangrow objection 22.5.22.pdf; Annexure A Its Engineered HVAC Review and Opinion.pdf; Annexure B Lot 1 proposed mechanical ventilation plans.pdf; Annexure C AIRAH Technical-Bulletin-Kitchen-Exhaust 2016.pdf; Annexure D Lot 1 proposed hydraulic plans.pdf; Annexure E Lot 1 Drainage _ stink pipe awning location.pdf;

Hi Adam and Lashta,

Please find attached our objection and attachments.

I could not see how to attach the documents to the submission form

Can you please confirm receipt and make it publicly available.

Many thanks
Liz Skerrett

PS The yellow notification is still not up on the site.

General Manager
Northern Beaches Council
council@northernbeaches.nsw.gov.au

22 May 2022

Attention: Lashta Haidari

RE: OBJECTION TO DA2022/0662 Lot 1, 63-37 The Corso Manly -Applicant: Huang Property Group

I am the owner of Lot 3 SP67337 / 63-67 The Corso, located directly above the proposed development.

Background

My company constructed the building in its present form having obtained Development Consent DA201/98 for backpacker accommodation and retail in 1999. The building comprises 3 lots

Lot 1 (441m2) the subject of this application, is a retail lot currently used as an art gallery. This lot was constructed as a retail lot. No purpose-built shafts apart from a small vent for A/C piping were constructed.

Lot 2 (46 m2) is a small retail lot with frontage to Market Lane. Currently used as a nail shop

Lot 3 (1158m2) currently operating as a backpacker and budget motel on part ground level, mezzanine, levels 1 and 2 and roof terrace. In 2020 Lot 3 obtained approval (DA2019/1398) for conversion of the backpacker to shop top housing comprising 12 residential units and 3 retail units

Owners Corporation SP67337 position on the application

The Owner's Corporation has not and will not approve any of the proposed works to the common property included in the application.

The Lot 1 proposal

The Huang Property Group (the applicant) proposal for an american themed Hard Rock Live venue includes:

- Change of use from retail to a pub and Hard Rock Live entertainment venue
- Hours of operation 7am – 3am, 7 days per week
- Patron capacity 534 persons
- Large commercial kitchen
- All mechanical ventilation from kitchen and toilets to services to exit under awing to The Corso
- All drainage pipes from grease arrestor and sanitary pipes to be located on top of the awning
- Guitar signage/logo 9.8m high, 5.2 wide
- Extensive new works below the flood planning level

- Internal works including
  - Extensive excavation of ground floor slab
  - Installation of below ground grease arrestor
  - Installation of below ground grease arrestor pump out line to Market Lane
  - Additional floor area to mezzanine
  - Removal of existing structural columns
  - Toilet facilities on ground and mezzanine level

OBJECTIONS TO THE PROPOSAL

Mechanical ventilation - kitchen and toilet exhausts to The Corso

The proposal is to take all services including kitchen exhaust in horizontal ducts continuously expelling warm air under awning to The Corso. This is contrary to Australian Standards, Building Code of Australia and NSW Public Health Regulation 2012.

The proposal is non-compliant with Council's standard condition for mechanical ventilation which requires external exhaust discharge to be above roofline and discharged in a manner that is not likely to cause an amenity impact. Any variation to this standard would set a dangerous precedent.

The proposal is non-compliant with existing conditions of consent for the building and would cause a nuisance to our property, neighbouring properties and the general public.

Australian Standard 166.8.2-2012 requires kitchen exhaust to be discharged at least 6 m from *any boundary to a public street, any outdoor air intake opening or natural ventilation device*. The Corso is a public street and any discharge immediately onto The Corso is non-compliant.

The toilet exhaust is also non-compliant as it is located under awning immediately adjacent to the kitchen exhaust and directly above the Lot 1 openable doors.

Attached
Annexure A: Opinion Brett Fairweather, Director, Its Engineered
Annexure B: Mechanical ventilation plans Lot 1 provided to the OC

Fire safety

Of major concern is the extensive use of horizontal ducting of the kitchen exhaust directly under the Class 3 backpacker accommodation.

The AIRAH Technical Bulletin 2016 prepared in conjunction with Fire and Rescue NSW deals with fire risks inherent in commercial kitchens and states that restaurants in buildings are a fire hazard and when located in a mixed use residential setting the risk increases exponentially. This is further exacerbated when mechanical ventilation ducts run outside purpose-built shafts.

As there are no purpose-built shafts to take the kitchen exhaust vertically to the outside it is proposed to attach long runs of horizontal ducting to the underside of the ceiling expelling through the front façade. The horizontal ducting proposed does not comply with Australian Standards and increases fire risk in the building.

The proposal contravenes existing By-Law No 15 in SP67337 Preservation of fire safety which prohibits a reduced level of fire safety in the lots and common property

Attached
Annexure C: AIRAH Technical Bulletin 2016

Location of drainage vents

The proposal is to locate the 3 x 100mm drainage/stink pipes above the awning under the Juliet balconies and openings into the building. Two of the pipes come from the 3000L grease arrestor and 1 pipe comes from the new sanitary facilities.

It is widely known that pipes venting from grease arrestors and toilet facilities emit offensive odours and are a nuisance, potential health hazard and would seriously detract from the amenity of all rooms and balconies on our property, neighbouring properties and general public. Northern Beaches Council reports that offensive odour is one of the most frequent air pollution complaints they receive. The expectation is for drainage vents to be located above roof line out of harms way.

The location of the drainage pipes is non-compliant with AS/NZS 3500.2:2021 which requires drainage vents to be located greater than 3 metres from any opening into a building. The awning is precisely 3 metres deep with a box gutter at the edge. Drainage pipes located anywhere on the awning does not comply.

Locating drainage pipes external to the building above the awning is non-compliant with Manly DCP as well as the building's original approval. DA201/98

Condition 17
All plumbing and waste pipes for the building shall be provided in internal ducts and the plans endorsed prior to release
Condition 18
All plumbing and drainage, including sewerage drainage stacks, ventilation stacks and water service pipes shall be concealed within the building. Plumbing other than stormwater downpipes shall not be attached to the external surfaces of the building

Annexure D: Lot 1 Hydraulic plans
Annexure E: Location of drainage vents on awning provided by Lot 1

Heritage

The property is a heritage listed and adjoins the significant New Brighton Hotel. The Corso is also a heritage item and an important public pedestrian promenade.

The proposal for a giant neon lit guitar logo hanging from the top of the building and fixed 5 metres into The Corso is incongruous with the character of The Corso. The proposal fails to meet any of the objectives of clause 4.4.3 of the MDCP in relation to signage. In particular *To prevent Signage from impacting on the presentation of the heritage item or area to the general public on heritage items and conservation areas.*

The proposed works to The Corso façade and awning including the installation of kitchen exhaust vents, toilet exhaust vents, grease arrestor trade and chamber waste drainage and sanitary drainage vents is incompatible with its listing and contrary to the Manly LEP

and DCP and existing DA conditions of consent for the building which requires all drainage pipes to be concealed within the building. Warm air from kitchen exhaust and toilet exhaust continuously expelling under awning would seriously detract from the promenade environment and pedestrian amenity.

Advertising

Existing By-law No 8 SP 67337 Advertising assigns our Lot 3 exclusive use to the signage and advertising of all external areas above the awning. The proposed guitar logo attached to the front façade contravenes this By-law and will not be permitted by the Owners Corporation.

Engineering and Flood hazard

A Flood Management Plan has not been submitted with the application.

The site is flood prone risk land in the MLEP and is subject to hydraulic hazard. The existing ground floor level is 5.1m AHD. The Flood Planning Level for the site is 5.84m AHD. Lot 1 is currently 750mm below the flood planning level. Recent rain events resulted in significant flooding of the ground floor.

The proposed change of use requires major new works including extensive excavation of the ground floor slab from boundary to boundary to accommodate a large commercial kitchen, underground grease arrestor (3-4m below current ground level), below ground grease pump out pipes and sewer connections. All new works would need to be constructed above the Flood Planning Level.

My company was responsible for the construction of the building in its current form in 2001. We experienced serious problems during the construction of the slab due to the loose fill (sand) and water table issues particularly along the boundaries. There are also significant concerns with the proposed removal of existing load bearing columns.

All the proposed works are considered high risk and could jeopardise the stability of the building and neighbouring properties. The applicant is further proposing that the ongoing maintenance and liability for the proposed works is the responsibility of the Owners Corporation.

Noise

The proposed changes to the ground floor to accommodate 534 Patron Live Entertainment + General Bar +Restaurant operating from 7am – 3am has significant noise impacts to the accommodation units and common property balconies directly above. This applies to the both the existing backpacker/deluxe motel rooms and the approved residential apartments.

We have engaged Acoustic Dynamics to assess the proposal. This report will be submitted shortly. Verbal feedback from our consultant is that the proposed use will be unable to meet the noise objectives and measures of Liquor and Gaming NSW or Manly DCP 3.4.2.3 Acoustical Privacy (Noise Nuisance)

The acoustic report submitted with the application gave no consideration was to the egress of patrons

Waste management

The waste management plan submitted with the application indicates waste service requirements being:

- 3 x 1100 Litre bins for general waste
- 3 x 1100 Litre bins for Recycling

This equates to over 3.5 times the current provision for the retail use which is 3 x 600 litre bins.

The existing service area was designed to accommodate a retail use in Lot 1 and Lot 2 and a backpacker in Lot 3. There is no capacity to increase the garbage storage in the service area for the proposed use.

All garbage in excess of what is currently provided for Lot 1 would need to be located within their Lot.

The service/garbage area is also a required fire exit and needs to be kept clear at all times.

Clause 4.6 variation - noncompliance with Floor Space Ratio

The proposal is noncompliant with Councils Floor Space standard (FSR) for the site. The proposal is to increase the floor space ratio by extending the mezzanine level by 43m2. This equates to an additional 75 patrons. This is a significant increase in patron capacity and its associated noise, amenity and management issues.

The applicants request to vary the FSR standard does not address the intensification of use. The applicant has not demonstrated that the development standard is unreasonable or unnecessary, nor that there are sufficient environmental grounds to justify the increased patronage. Varying council's FSR standard is not in the public interest and inconsistent with the objective 4.4 *(d) to minimise adverse environmental impacts on the use of adjoining land and the public domain.*

A clause 4.6 variation can only be supported if they result in a better planning outcome. There is no justification for the increase in patron capacity The request to vary the floor space ratio should not be supported.

About Hard Rock Live venues

Hard Rock venues are a chain of themed restaurants and live venues. There are currently 2 Hard Rock venues in Australia located at Darling Harbour and Surfers Paradise. Both venues are well removed from residential/accommodation uses. In USA Hard Rock Live venues are located in hotels, casinos and standalone business parks. The proposal to locate a Hard Rock Live venue in The Corso in close proximity to residential and accommodation sites has major amenity impacts.

This type of use is suited to a purpose-built venue located away from residential and accommodation uses.

While the use of the site for a pub and restaurant is permissible in the B2 zone the current application is an extreme version of that use and does not fit in the context of the immediate surrounds. An objective of the B2 zone is *to minimise conflict between land uses in the zone and adjoining zones and ensure amenity for the people who live in the local centre in relation to noise, odour, delivery of materials and use of machinery.*

The building was not constructed for this use and is not fit for purpose. The consequence of the proposed use would result in permanent amenity issues for the occupants of our property, surrounding properties and the general public.

Kind regards

Peter Skerrett
Owner
Lot 3 SP67337
63-67 The Corso, Manly

Liz Skerrett
Town Planner

16th May 2022

Sangrow Pty Ltd
c/- Liz Skerrett
63 The Corso, MANLY NSW 2095

RE: 63 THE CORSO – KITCHEN VENTILATION DESIGN
MECHANICAL ENGINEERING CONSULTANCY SERVICES

Dear Liz,

This document has been prepared at your request, to outline my general observations and Opinion of the compliance of the kitchen ventilation solution proposed for a tenancy in the above premises.

This information is intended to be read in its entirety and in conjunction with the referenced documents, as it identifies the development of my Opinion for the described application. I welcome the opportunity to discuss my observations and Opinion with all project stakeholders, to assist in the development of a consensus.

This review was not comprehensive and is not a substitute for proper design development, coordination and quality control processes expected in the usual course of a design. I have only provided sufficient information to support the opinion that I have formed.

I have prepared this Opinion based on the information provided to me by you on 04/05/2022 and on my training, studies and experience as a mechanical engineering consultant. While this experience includes roles in Technical Committees associated with the AS 1668 series of Standards, my Opinion reflects my own understanding of the relevant requirements and is not a representation by Standards Australia or others participating on these committees. More information on my experience and roles in these committees is included in the *About the Author* part of this document.

My advice is prepared to support this project's stakeholders when evaluating the compliance of the proposed ventilation design. This advice does not include a comprehensive review of the complete design and does not alter the roles and responsibilities of these stakeholders. Responsibility for compliance of all aspects of the project must be considered and managed by others.

During my review, I formed the opinion that the design includes details reflecting many departures from mandatory clauses in relevant Australian Standards. The proposed kitchen ventilation design therefore does not comply with the Deemed-to-Satisfy requirements of the current Building Code of Australia, but there are also some features that do not comply with additional requirements of the NSW Public Health Regulation 2012.

Additional expertise should be sought to substantiate the likely increase in fire safety risks in the building and the various approvals processes required when progressing this design.

Should you have any queries relating to this information, please contact the undersigned.

Regards,

IT'S ENGINEERED

Brett Fairweather
BE Mech (Hons) Dip Eng Prac | MIEAust | Affil.CIBSE | MAIRAH | ARPEng (Mech) | NSW Registration #PRE0000034
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P 0403 195 883

BASIS AND METHOD OF REVIEW

The preparation of this Opinion followed my preliminary desktop review of selected information provided by phone and email in May 2022. This Opinion is limited to features for mechanical smoke control in this given information and as required by the Codes and Standards identified in this document.

METHOD

In preparing this document, I have structured its contents to lead the reader through the development of my Opinion, as follows:

1) Determine and identify selected prescriptive requirements for kitchen ventilation design
2) Explain where these requirements relate to features in the project's design
3) Consider how the project's design compares to the explained requirements
4) Offer my Opinion of the compliance of the proposed design

This document has been prepared with direct references to particular clauses to help explain my observations. Reference should be made to each of these while reading my Opinion.

TERMINOLOGY ADOPTED

Unless noted otherwise, terminology adopted throughout this Opinion is intended to remain consistent with the referenced Codes and Standards. Where alternative terminology is adopted in design and documentation, even though it may be commonplace throughout parts of the construction industry, it can contribute to confusion and misinterpretation of the prescribed requirements of applicable Codes and Standards. Use of terminology adopted by Standards can reduce this risk.

LIMITATIONS

This Opinion was prepared with a focus on a specific query or queries, without a comprehensive review of the complete design and is based only on information available at the time. This does not address any other aspects of the mechanical services in the development and shall in no way relieve any stakeholders of any legal responsibility or obligations with respect to design, installation, operation and respective certifications for the development.

This Opinion has been prepared based entirely on a Deemed-to-Satisfy application of the referenced Codes and Standards, as requested and for the above project only.

References to content in Volume 1 of NCC2019 Amendment 1 and the NSW Public Health Regulation 2021 are provided for context, leading to the application of the referenced Australian Standards. Validation of comments provided on these documents should be sought from a qualified professional in the field of building surveying, BCA consultancy or certification and the correct application and interpretation of NCC2019 must be verified by the project's certifying authority.

This Opinion is limited to the identified requirements of referenced Codes and Standards for a conventional application of the required kitchen ventilation systems.

All other aspects of the project (including those for all other services) where not discussed in this document are assumed to be completed in accordance with the relevant requirements.

The application of systems outlined in this Opinion does not address any requirements that your client or any local authority may have to exceed the minimum provisions of the Building Code of Australia or other regulated requirements.

SPECIFIC QUERIES

My Opinion was specifically requested to identify whether the proposed kitchen ventilation for the Ground Floor tenancy at 63 The Corso Manly, as prepared by JC Ventilation and Engineering on 13/08/2021 complies with relevant mechanical services requirements.

This Opinion may be used to support the development of the project's certifier informed opinion during approvals processes or by experts in other associated areas of risk as identified.

PROJECT DESIGN FEATURES

Without prior involvement in the project or knowledge of the design referenced in this document, my Opinion has been developed solely based on the information received on 04/05/2022. This information included:

1) Mechanical Services Design Package prepared by JC Ventilation and Engineering Pty Ltd Consulting and Design
    a) Drawing 01, Revision C, 13/08/2021 – *Exhaust Hood Layout*
    b) Drawing 02, Revision C, 13/08/2021 – *Mechanical Exhaust System, Ground Level Option 1*
    c) Drawing 03, Revision C, 13/08/2021 – *Mechanical Exhaust System, Mezzanine Level Option 1*
    d) Drawing 04, Revision C, 13/08/2021 – *Section 1 – Option 1*
    e) Drawing 05, Revision C, 13/08/2021 – *Section 2 – Option 1*
2) Email from Liz Skerrett on 04/05/2022, requesting her own observations and requesting my involvement.
3) Discussion by phone with Liz Skerrett on 04/05/2022, including a brief outline of the use of the existing building.

An outline of the building form and features relevant to this Opinion was found from descriptions in the above documentation, identifying that;

1) The ground floor of the existing building was constructed as a retail space.
2) The upper floors of the existing building operate as backpacker accommodation.
3) There are no vertical shafts available to accommodate a new kitchen exhaust through upper floors of the existing building.
4) An existing by-law in the development prevents works that result in a reduced level of fire safety in the building.

While I will comment on the minimum fire safety requirements for mechanical services, I am unable to comment on the level of fire safety of the proposed design or any other features in the building. Assessment of the level of fire safety will require input from a suitably qualified and experienced Fire Safety Engineer.

I was not provided with any information relating to a fire safety assessment or any Performance Solutions relevant to the proposed design.

RELEVANT PRESCRIPTIVE REQUIREMENTS FOR KITCHEN VENTILATION DESIGN

In this part, I identify the requirements prescribed under the Building Code of Australia (NCC2019 Amendment 1) and the NSW Public Health Regulation 2012.

Clause F4.12 in the Building Code of Australia requires that a commercial kitchen must be provided with a kitchen exhaust hood complying with AS 1668.1 and AS 1668.2 when the power input to appliances exceeds prescribed limits. I assume an assessment of these limits by the designer has concluded that the kitchen ventilation system is required, as features reflecting such a system are included in the plans provided to me.

In addition, Section 6 of Part 2 Division 2 of the NSW Public Health Regulation 2012 requires that an air handling system must be installed in accordance with AS/NZS 3666.1:2011.

Selected requirements of these referenced Standards are outlined below.

Omission of reference to other clauses or other features of the design is not intended to reflect an opinion of compliance with other requirements in any way. I have just not commented on these details.

SELECTED REQUIREMENTS FROM AS 1668.1

AS 1668.1:2015 Amendment 1 *The use of ventilation and air conditioning in buildings, Part 1: Fire and smoke control in buildings* prescribes features of mechanical services that are necessary to restrict the spread of fire and smoke within buildings and to restrict the initiation of fire within ductwork.

Section 6 in AS 1668.1 is relevant to kitchen exhaust hood systems. The Standard identifies that Section 6 shall be read in accordance with the relevant requirements of Sections 2 and 3.

1) Clause 6.2.3.2 requires that kitchen exhaust ducts '*shall be installed vertically or near-vertically wherever practicable*'.

   Ducts depicted in the design are generally installed horizontally. This requires an assessment of whether there is any practicable way the existing building could accommodate vertically or near vertically kitchen exhaust ductwork.

   I was advised that there are no existing provisions for vertical ducts to pass through the upper storeys of the existing building, so it is unlikely that the installation of vertically or near-vertically ducts is practicable.

   Where a vertical duct installation is not practicable, the Standard requires the minimisation of ducts installed horizontally, but the coordinated layout of the tenancy in the design depicts the kitchen at the furthermost distance from the proposed discharge location, without any apparent provisions to minimise the horizontal ductwork and effectively maximising the length of horizontal ductwork. This is in contradiction to the requirements of AS 1668.1.

   This feature of the design therefore does not comply with AS 1668.1.

2) If minimised horizontal exhaust duct lengths could be achieved, Clause 6.2.3.2 requires a *'rise in the direction of airflow of not less than 0.5%*' (equating to 1:200).

   The horizontal ductwork depicted in the design is laid flat, with some instances of airflow travelling downward.

   These features of the design therefore do not comply with AS 1668.1.

3) If minimised horizontal exhaust duct lengths could be achieved, Clause 6.2.3.2 requires large access panels for cleaning '*at intervals not exceeding 3 m*'.

   In one part of the design, access panels are more than 5m apart.

   This feature of the design therefore does not comply with AS 1668.1.

4) Clause 6.2.3.2 also requires large access panels for cleaning at each change in direction, regardless of the orientation of ductwork.

   There are numerous changes in direction shown in the design without such access panels.

   This feature of the design therefore does not comply with AS 1668.1.

5) Clause 6.2.3.2 requires that '*a drain fitted with a grease-tight tap or plug shall be provided at the lowest point of each run of ducting*'.

   The design includes no details of such taps or plugs.

   This feature of the design therefore does not comply with AS 1668.1.

6) Clause 6.2.3.3 requires that kitchen exhaust ductwork within the compartment served by the kitchen hoods '*shall be not closer than 300 mm to any combustible material or shall be insulated to achieve a -/-/30 FRL*'.

   The combustibility of materials within 300 mm of the ducts shown in the design should be assessed by a relevant expert, but the design does not include any apparent details to address these options or the risk that occupants could move combustible materials within this 300mm zone.

   This feature of the design therefore may not comply with AS 1668.1.

7) Clause 6.2.3.1 requires ductwork construction to comply with Clauses 2.3.1 and 2.3.2. These clauses prescribe limitations on the materials, combustibility and temperature of fusion of materials used in the duct systems, including the insulation.

   Details of the proposed '*Acoustic Lined 50mm Perforated Metal*' in the design must be assessed in order to determine the compliance of this feature. This information is not available in the design.

SELECTED REQUIREMENTS FROM AS 1668.2

AS 1668.2-2012 Amendment 2 *The use of ventilation and air conditioning in buildings, Part 2: Mechanical ventilation in buildings* prescribes features of mechanical services that are necessary to achieve acceptable levels of health and amenity associated with these systems.

The local exhaust requirements of Section 3 in AS 1668.2 are relevant to kitchen exhaust hood systems of more than 1,000 L/s. Total air quantities for the design are not clear from the drawings, but technical data available for the nominated fan (MMD 806/3) indicates that the design may be in the order of 6,000 L/s, but certainly exceeding 1,000 L/s.

1) Clause 3.10.3 requires that any air discharges deemed to contain objectionable effluent (including kitchen exhaust of more than 1,000 L/s) shall '*be arranged vertically with a discharge not less than 5 m/s*'.

   Details on Drawings 03 and 04 show that the exhaust discharge is arranged horizontally, at an unknown velocity.

   Commentary to guide designers in the development of a Performance Solution that may permit concessions to this requirement is included for consideration at C3.10.3, but the Standard itself does not permit horizontal discharge of kitchen exhausts of more than 1,000 L/s, as shown for this design.

   This feature of the design therefore does not comply with AS 1668.2.

2) While the requirements for a Performance Solution to accommodate a horizontal discharge are prescribed in the Building Code of Australia (not in AS 1668.2), no evidence is included with the design to demonstrate the suitability of the proposed electrostatic filtration system for the proposed cooking processes. The design identifies that the discharge airflow is '*Clean Air 99%*', but does not identify which contaminants (particulates, odours, smoke) are reduced by '*99%*' and whether these are relevant or sufficient for this application.

   This feature of the design therefore does not comply with AS 1668.2 or the Building Code of Australia.

3) Clause 3.10.3(c) requires kitchen exhaust of more than 1,000 L/s to be discharged at least 6 m from '*any boundary to a public street, any outdoor air intake opening or any natural ventilation device or opening*'.

   If The Corso is deemed to be a public street, then the air discharge in the design immediately onto The Corso represents a non-compliance with AS 1668.2.

   The kitchen exhaust in the design is also shown immediately above the openable windows across the shopfront. These windows could operate as natural ventilation devices for ventilation of part of the restaurant or will serve as a natural ventilation source for the make-up of the imbalance between supply and exhaust systems within the space. If nothing else, adverse wind effects will result in air at a lower quality than outdoor air in the locality.

This configuration is a risk to the health and amenity for occupants and staff in the restaurant and is likely to represent a non-compliance with AS 1668.2.

4) Clause 3.10..2 requires bathroom exhaust to be discharged at a minimum distance from '*any outdoor air intake opening, natural ventilation device or opening*'. Minimum prescribed distances are selected based on airflow for each system, but are not less than 1 m.

   The bathroom exhaust in the design is positioned immediately adjacent to the kitchen exhaust described above and also immediately above the openable windows below.

   This feature of the design therefore does not comply with AS 1668.2.

5) Clause 3.10.1 requires that '*all exhaust air shall be discharged to atmosphere in such a manner as not to cause danger or nuisance to occupants of the building, occupants of neighbouring buildings or members of the public*'.

   The perception of '*nuisance*' may differ, but if the noise, air movement or any remaining grease, smoke and/or odours in the exhaust discharge below the shopfront awning (approximately 3 m above the footpath) is perceived as a nuisance, then the design will not comply with this requirement.

   Note 2 to Clause 3.10.2 reinforces the need to address the risk of nuisance, stating that '*where discharge extends less than 3 m above a pedestrian thoroughfare, the discharge should be engineered not to create nuisance*'. One section in the design indicates that the discharge is around 2.8 m above the footpath.

   For an estimated 6,000 L/s (from details available in the design), exhaust will be discharging through the 1,700 x 500 mm louvre with a face velocity of approximate 9 m/s. This is far in excess of discharge velocities in most mechanical services designs and is likely to result in significant air movement and noise in the vicinity of the louvre. This arrangement does not reflect incorporation of the recommended engineering required to not create nuisance.

   I expect that this arrangement will be perceived as a nuisance by at least some of the occupants of the building, occupants of neighbouring buildings and members of the public, so the risk of a non-compliance with AS 1668.2 for this feature of the design is high.

SELECTED REQUIREMENTS FROM AS/NZS 3666.1

AS/NZS 3666.1:2011 *Air-handling and water systems of buildings—Microbial control, Part 1: Design, installation and commissioning* prescribes features of mechanical services required for microbial control. It also includes requirements for safe working access to air handling systems and documentation that must be prepared before air-handling systems are brought into service.

1) Clause 2.1.2 requires that '*easy and safe access for installation, commissioning, operation and maintenance*' be provided for air-handling systems.

   Several serviceable features for the proposed kitchen exhaust system, including those that are necessary but missing from the design, are not positioned to enable easy and safe access (including instances immediately above the entry ramp), which represents a non-compliance of these features with AS/NZS 3666.1.

2) Clause 2.11.1 requires that '*ductwork, components and insulation, shall be manufactured and installed in accordance with AS 4254*'.

   For reasons outlined below, the design does not incorporate features required by AS 4254 and is therefore not compliant with AS/NZS 3666.1.

SELECTED REQUIREMENTS FROM AS 4254.2

AS 4254.2-2012 *Ductwork for air-handling systems in buildings, Part 2: rigid duct* prescribes requirements for materials, construction and installation for ductwork for air-handling systems in buildings.

1) Clause 2.1.3 identifies the requirements for liquid-tight cleanouts in kitchen exhaust ductwork that are '*easily accessible and large enough to enable access to clean the internal surfaces of the duct or plenum*'. This includes the access provisions previously identified in AS 1668.1, plus 'at each duct junction'.

For reasons previously stated, access panels in the design do not satisfy these requirements and this feature in the design represents a non-compliance with AS 4254.

2) Clause 2.1.3 also identifies that '*vertical take-off ducts shall not be located directly over hood exhaust openings*'.

   The design appears to include vertical take-off ducts at all 6 hood exhaust openings shown.

   This feature represents a non-compliance with AS 4254.

ADDITIONAL OBSERVATIONS

In 2016, the Australian Institute of Refrigeration Airconditioning and Heating (AIRAH) published a Technical Bulletin titled '*Fire safety – Kitchen hood exhaust systems'*. This document is readily available online and should be familiar to experienced mechanical services designers, as well as other stakeholders identified in the bulletin.

AIRAH identifies that '*restaurants in buildings are a fire hazard'*, and that that '*in Australia, kitchens are reported as the No.1 source of fires in buildings…(up to 50 percent in commercial buildings)*'. These risks are therefore significant and AIRAH's guidance aims to highlight the main fire safety issues.

While not specifically referenced in Australian Standards, this bulletin supports many of the requirements that I have identified and is useful when identifying increasing fire safety risks in kitchen ventilation designs.

AIRAH's guidance identifies that exhaust fans '*must have the motor and drive located out of the airstream*'.

The '*ASHRAE Handbook – HVAC Applications*' is another publication that is recognised internationally by experienced mechanical services designers. This handbook also identifies that for kitchen exhaust systems, '*the fan should be designed to keep the motor out of the airstream*'.

The '*MMD 806/3*' fan nominated in the design includes a motor within the airstream, representing an increased fire risk over good design encouraged by the above industry guidance.

OPINION AND RECOMMENDATIONS

It is my opinion that:

1) A number of features depicted in the design presented for my review do not comply with requirements of AS 1668.1, AS 1668.2, AS/NZS 3666.1 and AS 4254.2.

   If works proceeded in accordance with this design, the level of fire safety, smoke control, health, amenity and safe work provisions would be less than minimum requirements required by Regulations, Codes and Standards that apply to this work. If all other parts of the building satisfy the relevant requirements for those areas, this design introduces a reduction in these levels of occupant and community protection.

   I therefore recommend that works do not proceed in accordance with this design.

2) Qualification or quantification of the level or amount of reduction in the above requirements will require assessment by a suitably qualified and experienced Fire Safety Engineer and other relevant professionals.

   I recommend that a Fire Safety Engineer and other relevant professionals are appointed to qualify or quantify the level of reduction in fire safety and other identified requirements.

3) My observations and comments should not be relied upon as a comprehensive compliance assessment. It is limited to the details as described. Further assessment will require a more detailed review.

ABOUT THE AUTHOR

Brett Fairweather is a registered professional mechanical engineer with experience in the design of air conditioning and mechanical ventilation systems, as well as practical knowledge of the relevant Australian Standards applicable to these systems.

Brett has represented local engineering practices for over 20 years and runs a mechanical services consultancy to support other practitioners throughout the industry. He was the first engineer to be registered as an AIRAH Registered Professional Engineer (ARPEng) by the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) when the registration scheme commenced in 2020.

Brett is registered as a *Professional Engineer – Mechanical* and *Design Practitioner* with NSW Fair Trading.

Brett is the current chairperson for the technical committee responsible for AS 1668.1 (Fire and Smoke Control) and is also a member of Standards Australia's ME-062 subcommittees responsible for Standards AS 1668.2 (Mechanical ventilation in buildings) and AS 1668.4 (Natural ventilation of buildings). He also represents a number of industry bodies in the delivery of seminars and training related to mechanical ventilation, fire and smoke control and maintenance of essential mechanical systems.

Brett represents Engineers Australia through their Building Reform Experts Panel (BREP) and is also AIRAH's representative on the national Building Codes Committee for the Australian Building Codes Board.

A more detailed CV is available on request.

MECHANICAL EXHAUST SYSTEM

63-67 THE CORSO
MANLY

OPTION 1

Any deviation from this design and/or specified equipment will result in failure to comply with Electrical Safety Australian Standard AS/NZ 60335.1 and Fire Testing Clause 3.4 of AS1530.1 - 1994. It is an offence to supply or offer prescribed electrical equipment unless it is electrical certified to Australian Standard AS/NZ 60335.1 and Fire Testing Clause 3.4 of AS1530.1 - 1994.

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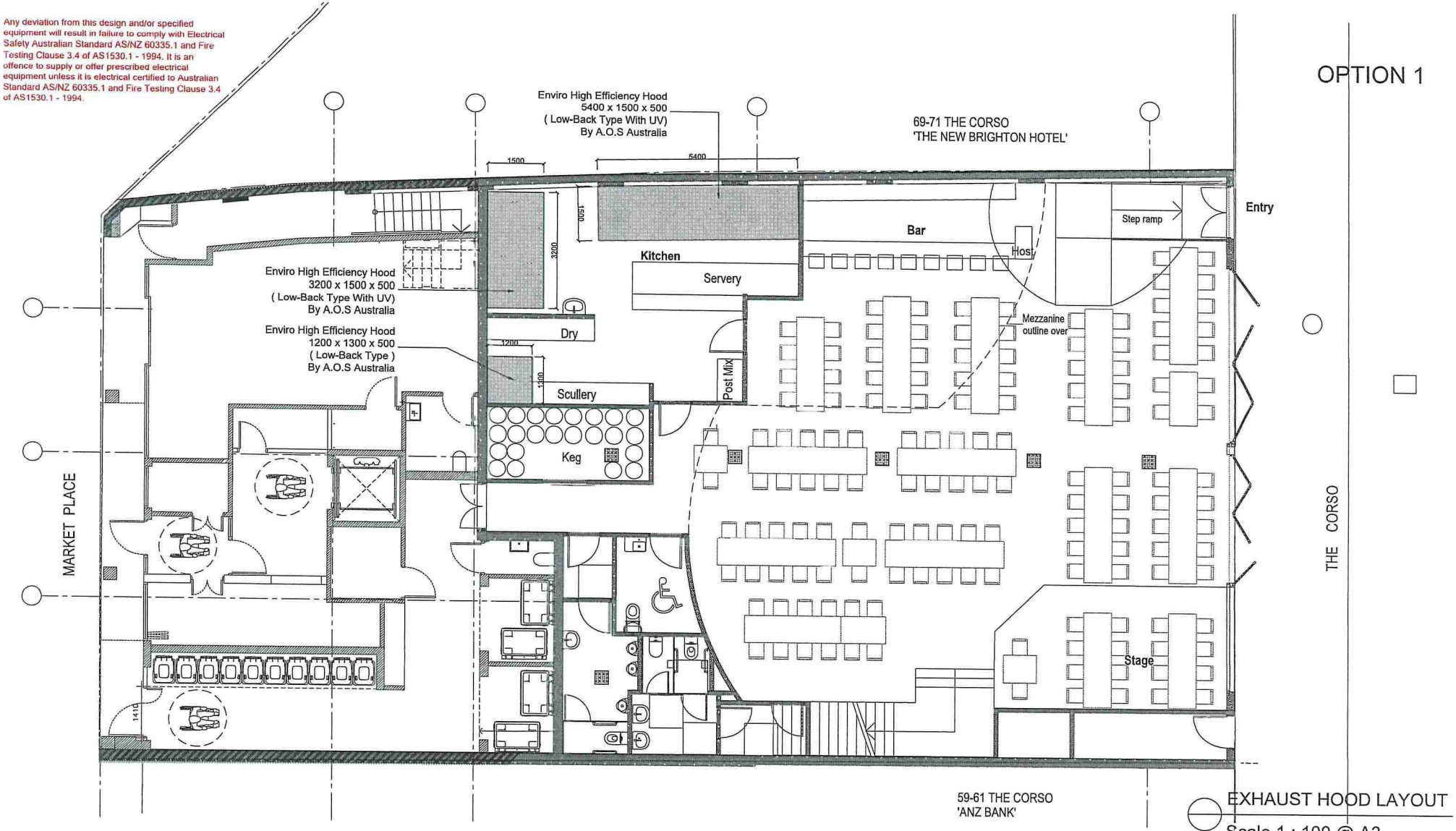

EXHAUST HOOD LAYOUT

Scale 1 : 100 @ A3

ISS	AMENDMENT	DATE
A	FOR INFORMATION	03/08/2021
B	FOR INFORMATION	09/08/2021
C	FOR INFORMATION	13/08/2021

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PROJECT :	63-67 THE CORSO MANLY
DRAWING TITLE :	EXHAUST HOOD LAYOUT
APPROVED :	G.Clark
DRAWN :	JC

SCALE :	1 : 100 @ A3
DATE :	13/08/21
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ISSUE :	C

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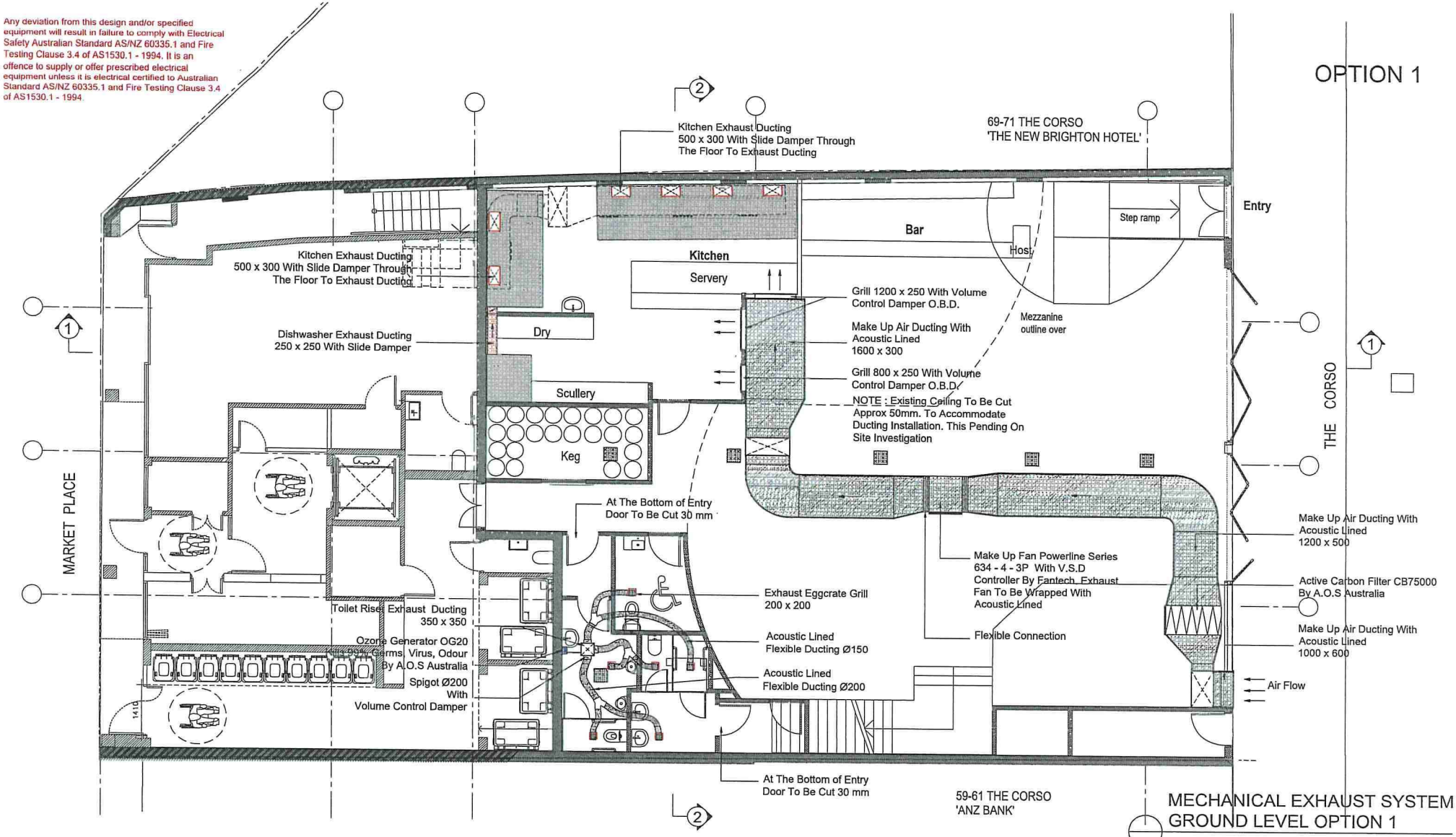

MECHANICAL EXHAUST SYSTEM GROUND LEVEL OPTION 1

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APPROVED :	G.Clark
DRAWN :	JC

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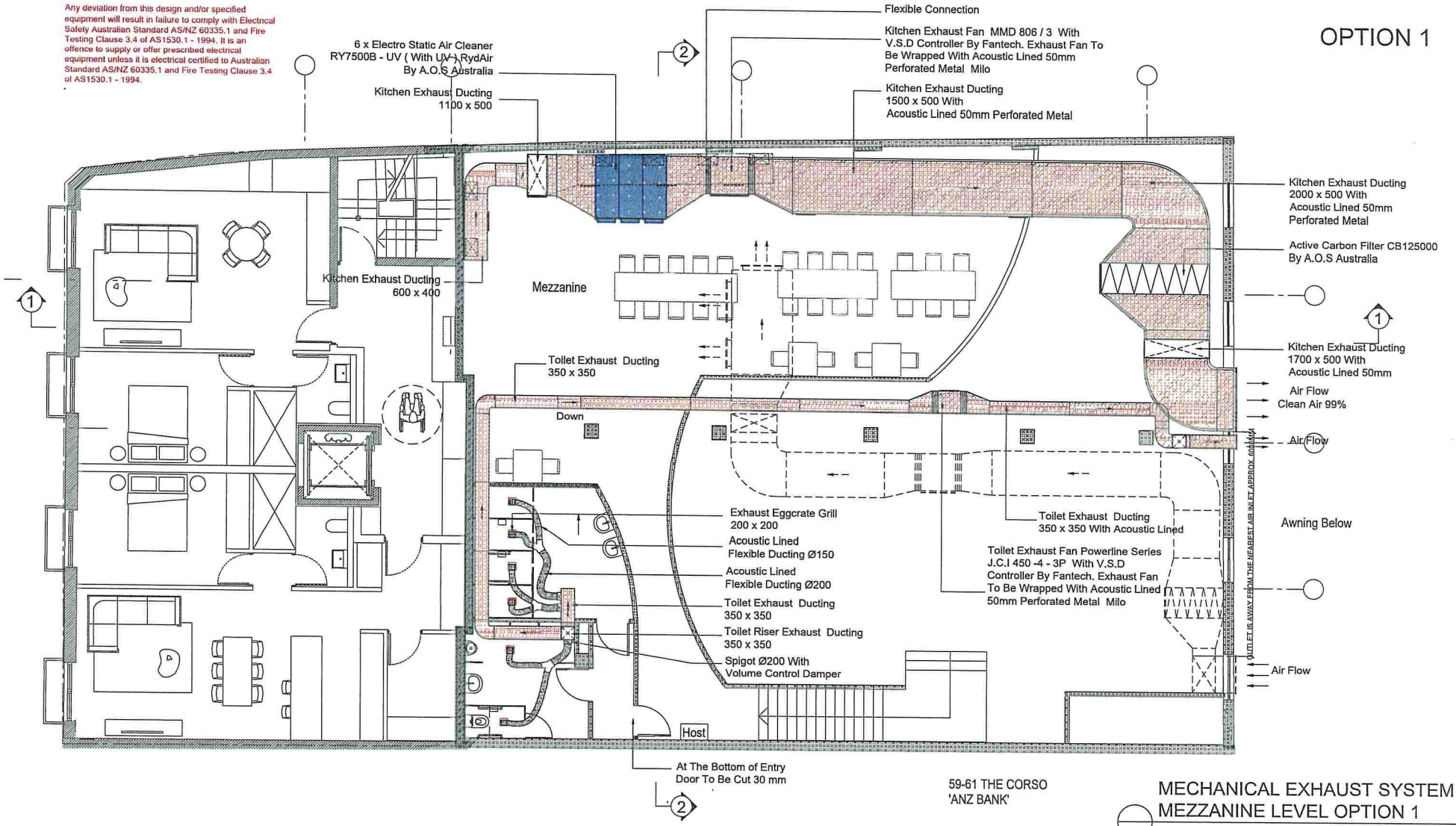

MECHANICAL EXHAUST SYSTEM MEZZANINE LEVEL OPTION 1

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PROJECT :	63-67 THE CORSO MANLY
DRAWING TITLE :	MECHANICAL EXHAUST SYSTEM MEZZANINE LEVEL OPTION 1
APPROVED :	G.Clark
DRAWN :	JC

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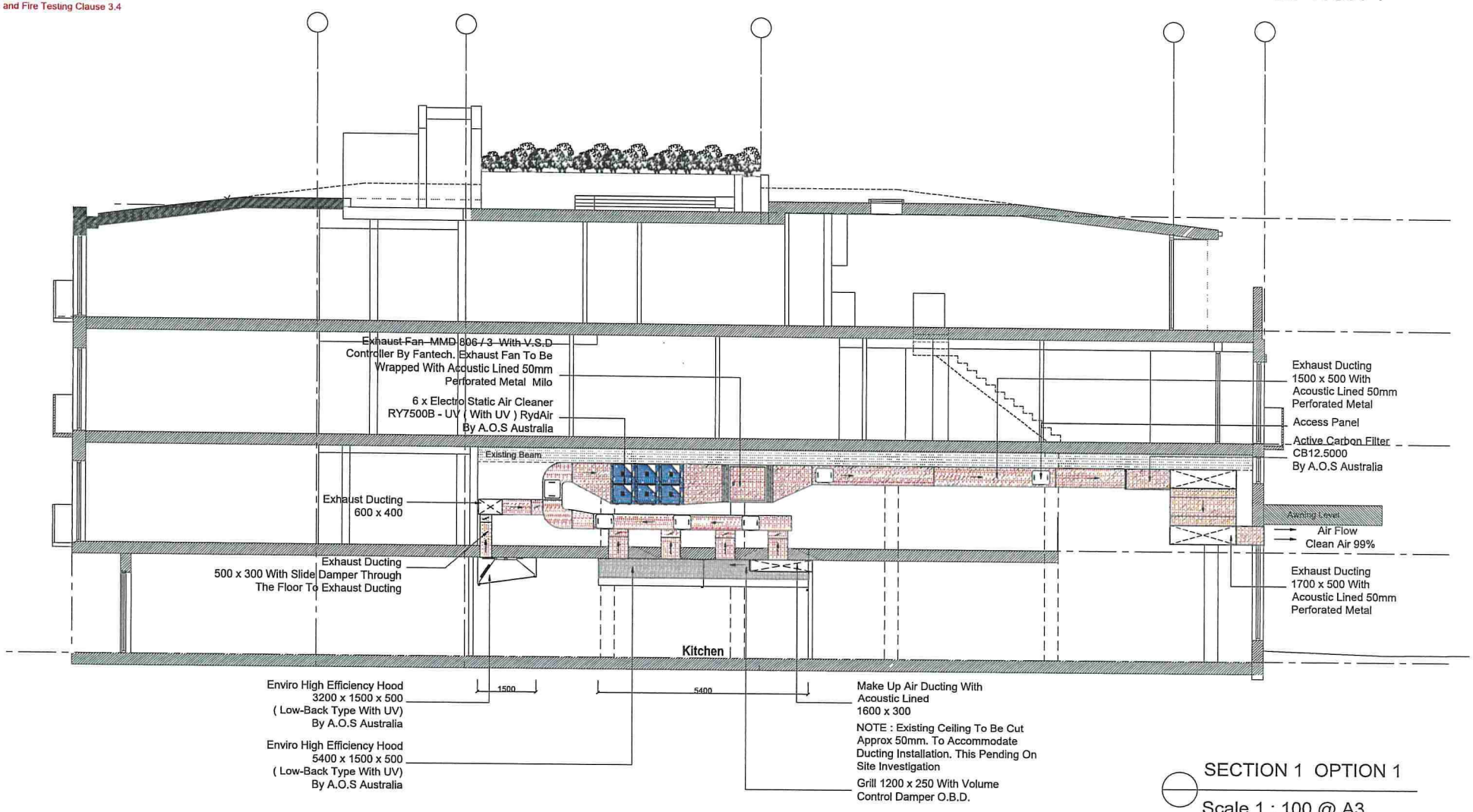

SECTION 1 OPTION 1

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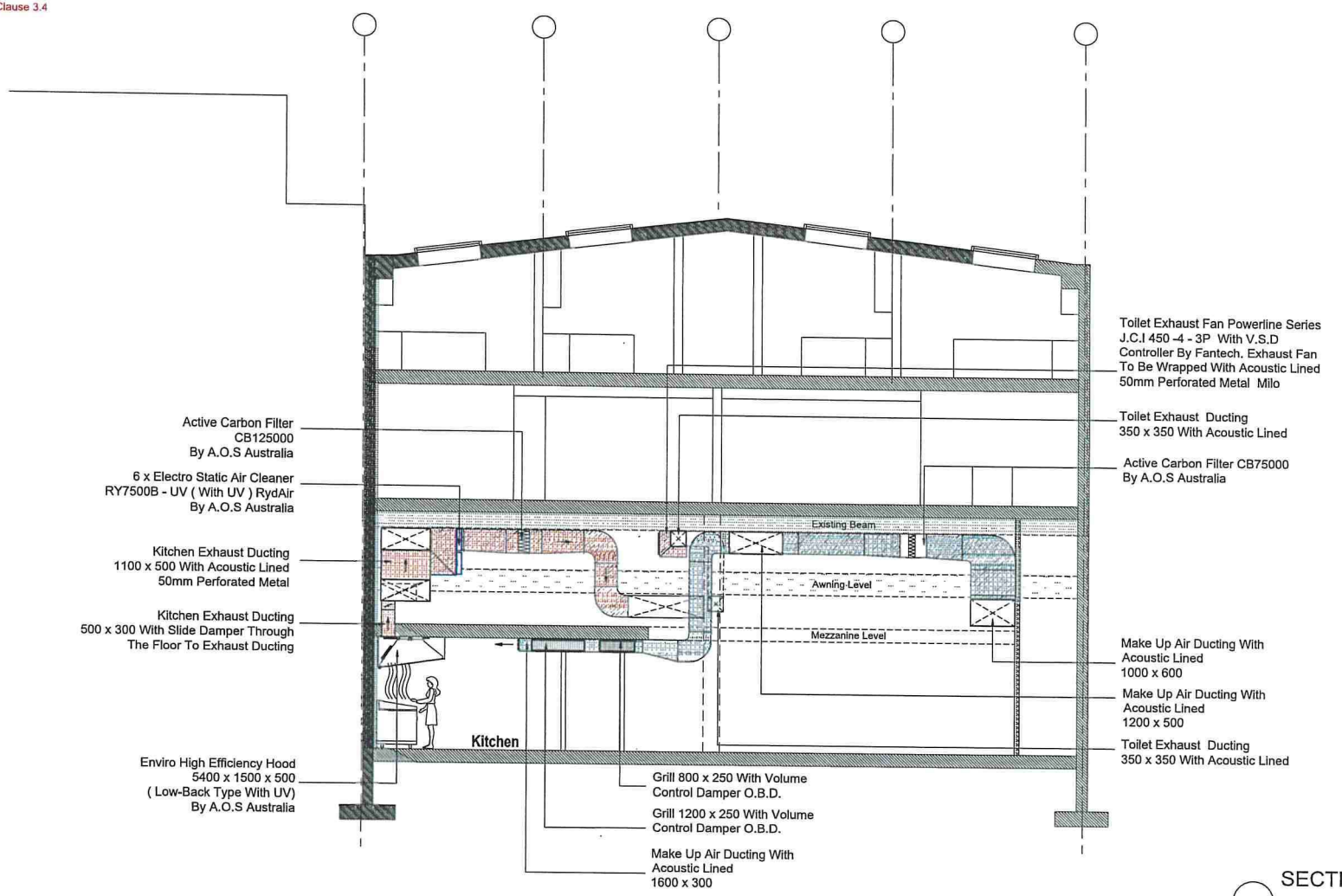

SECTION 2 OPTION 1

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THE AUSTRALIAN INSTITUTE OF
REFRIGERATION, AIR CONDITIONING AND HEATING

TECHNICAL BULLETIN

Fire safety –
Kitchen hood exhaust systems

Understanding and addressing
the special fire risks inherent in
commercial kitchen ventilation systems

TECHNICAL BULLETIN 2016

AIRAH

Fire safety –
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Preface

Kitchen exhaust systems continue to feature prominently in commercial building fire events.

Fire safety within kitchen ventilation systems in not just a matter for the system designer or system installer. The actions of the facilities manager, the maintenance contractor, and the system owner or operator are also critical to ensuring safe outcomes.

In the light of recent updates to relevant Australian Standards, recent changes to the maintenance requirements and focus of the National Construction Code, and the continuing fire risks within kitchens, AIRAH undertook to develop a fire safety technical bulletin on the exhaust ventilation topic, in partnership with the industry.

This technical bulletin has been developed for use by technical service providers, facilities managers, and operators of commercial kitchens.

It aims to highlight the main fire safety issues, promote a common language, and improve understanding of the risks and resulting responsibilities of all participants in the supply chain, from design and installation through to operation and ongoing maintenance.

Kitchen ventilation systems and their impact on fire safety can be improved within the community. Systems need to be designed and installed in accordance with the established rules. Ongoing maintenance and inspection should be targeted to the actual usage of the facility and its delivery should be verified. AIRAH hopes that this fire safety technical bulletin will go some way to improving industry performance in this area and reducing the incidence of serious fires within kitchen exhaust systems.

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AIRAH technical manager

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This Technical Bulletin was prepared by AIRAH in collaboration with a range of AIRAH members, industry organisations and individuals. The following organisations and individuals are acknowledged for their contribution to its development:

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About AIRAH

The Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) is an independent, specialist, not-for-profit technical organisation providing leadership in the HVAC&R sector through collaboration, engagement and professional development.

The Institute's mission is to lead, promote, represent and support the HVAC and related services industry, and membership. The Institute produces a variety of publications, communications and training programs aimed at championing the highest of industry standards. AIRAH encourages world's best practice within the industry, and has forged a reputation for developing the competency and skills of industry practitioners at all levels.

Contents

1. Kitchen exhaust – is there a safety problem?

There continues to be fire incidents involving the mechanical exhaust ventilation systems of commercial kitchens. Given the presence of heat and high fuel loads, fires in kitchens are not uncommon. However, when the incident extends into the mechanical exhaust system, safety risks and building impacts can rapidly escalate, sometimes resulting in devastating and widespread damage. These high-intensity fires move and spread rapidly, are difficult to locate and extinguish, and are susceptible to remote re-ignition and break-out.

This technical bulletin is provided to help raise awareness among property owners and restaurant proprietors about the fire risks and dangers associated with kitchen exhaust ventilation systems. It discusses the inherent fire risks, outlines regulatory and compliance requirements, highlights recent changes to applicable Australian Standards, looks at best-practice approaches, and emphasises the importance of ongoing effective cleaning and maintenance.

FIRE FACTS

Duct fires can be intense and reach temperatures of 1,000°C within minutes – hot enough to melt some metals and ignite surrounding combustibles. Fire statistics from Australia, the UK and the US show that fires in restaurants predominately occur in kitchens. The ignition of cooking materials accounts for almost half of all commercial kitchen fires and almost all of these (90 per cent) get into the kitchen hood exhaust system. Many restaurants never re-open after suffering a fire loss. Insurance policies may exclude claims related to uncleaned or grease-laden exhaust ducts. Insurers are aware of these fire risks – are you?

Always read the small print!

2. Kitchen exhaust – what are the fire hazards?

Fires are common in restaurants and typically start in the kitchen area. Cooking materials are the most frequent 'first item' ignited. Experience shows that the majority of kitchen fires will involve the kitchen exhaust hood or ductwork.

Kitchen exhaust fires can spread in a number of ways. A fire that originates within the kitchen or at the hood filters can spread into and up the ductwork system, fuelled by the oil and grease within the duct. A fire within the duct can ignite combustible materials outside of the duct, via radiant heat transmission, or can ignite grease that has leaked out of duct seams, spreading the fire in the building. Because fire dampers are not allowed within kitchen exhaust ductwork, fire spread within and between ducts can compromise a building's passive fire protection such as fire-rated compartments.

Fire dampers, which are usually installed in ventilation ducts to prevent fire spread, are not permitted within a kitchen exhaust duct system. They do not work in kitchen exhaust because grease on the downstream side of the damper will ignite before, and irrespective of, damper closure. The potential for false operation of the fire damper is also greater than normal and closure, other than in a fire situation, can have serious consequences for kitchen ventilation.

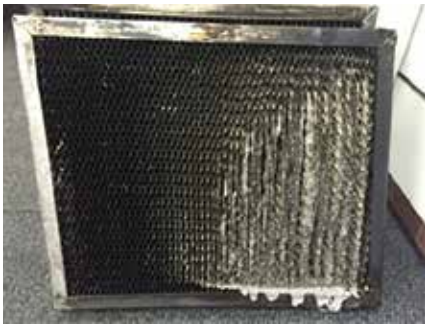


Figure 1: Heat of the fire melted the metal grease filter.

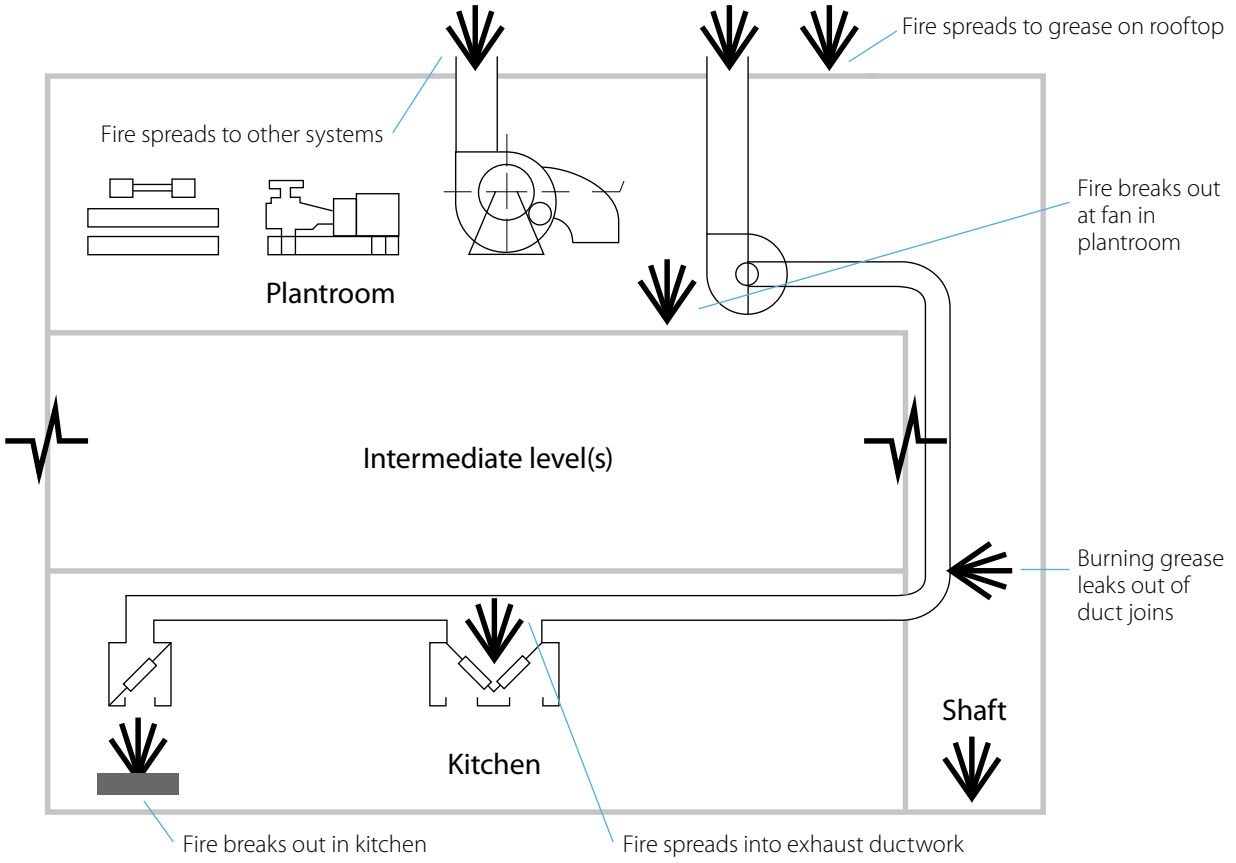


Figure 2: Fire in kitchen spreading into duct and then fire in duct spreading/breaking-out to another area.

Restaurants in buildings are a fire hazard. When a restaurant is located in a larger building or complex, such as a hotel, hospital, mall, airport or multi-storey residential development, the risks increase exponentially. A fire in a kitchen exhaust system in Heathrow Airport shut down three terminals, delayed or cancelled hundreds of flights, and generated hundreds of millions of dollars in losses that far exceeded the physical damage bill. That fire spread through 200m of exhaust ductwork to a plantroom before it was extinguished.

Figure 3: A fire within the duct can ignite combustible materials outside of the duct, spreading the fire in the building.

3. Identifying the fire risks

A fire within the duct system generally occurs due to the ignition of flammable material that has built up at the grease removal device (filters). The combination of fuel, air movement and heat can result in a strong and significant fire event.

All fire risk analysis fundamentally boils down to the three elements that are required for a fire to occur: fuel, oxygen, and ignition or the Fire Triangle.

Figure 4: The Fire Triangle – fuel/heat/O_2 = grease/flame/air.

Fire prevention must disrupt one or more of these elements.

Without heat the fire can't begin, without fuel the fire can't grow and without air the fire can't spread.

In a commercial kitchen hood exhaust ventilation system all three of these elements are highly prevalent –

Fuel: The grease derived from cooking processes enters the system with the ventilation air. High air velocities help to entrain and entrap cooking contaminants. Grease filters will capture a percentage of this, depending on their performance efficiency, installation quality, and cleanliness management. No filter captures 100 per cent of the grease, and any grease that passes through or around the filters will build-up on the internal hood, duct, and fan surfaces. Accumulated grease can leak out through duct seams and joins, or can pool in some parts of the ductwork to provide reservoirs of warm, highly flammable fluids and vapours that are ripe for ignition. Solid fuel cooking can create volatile gases created by incomplete combustion of the wood. These gases condense in the exhaust duct and mix with water vapour to form a tar-like creosote substance that sticks to the duct.

Ignition: There are many ignition sources within commercial kitchen environments: open-flame cooking devices, flaming cooking techniques, sparks and soot from wood or charcoal burners, even the heat generated from some types of cooking appliances can provide enough energy to ignite warmed grease, which then only needs a supply of oxygen to continue burning. Flare-ups from cooking equipment are the dominant cause of ignition.

Oxygen: The primary purpose of the ventilation ducts is air movement, so there is more than enough air available within the duct system to support a large fire. Once combustion commences the duct often acts as a chimney, channelling smoke and air to ventilate the fire. If this occurs in the reverse direction, large amounts of hot toxic smoke can enter the kitchen area and building, via the hoods.

Fire-related hazards in a kitchen include:

- Flames, sparks and hot gases from food preparation can ignite residues in exhaust ducts
- Food preparation equipment left without supervision during operation
- Failure to switch-off equipment, especially at the end of activity
- Overheated oils that can lead to spontaneous combustion
- Food preparation equipment based on solid fuels
- Gas blowtorches used for browning some foods
- Poorly operating thermostats or lack of thermostat or fault-detecting equipment
- Faulty or overheating electrical equipment
- Metal exhaust flues that conduct heat and ignite nearby material or debris
- Ovens without igniters/pilot lights (lit with burning pieces of paper).

4. Addressing the fire risks

Meeting the latest standards

Compliance with the relevant standards is very important.

The National Construction Code (NCC V1 2016) requires that commercial kitchens are provided with kitchen exhaust hoods in compliance with AS/NZS 1668.1-2015 and AS 1668.2-2012. In order for a hood to comply with AS/NZS 1668.1, the whole exhaust system must comply. These standards have been updated and it is important that designers and installers are working to the correct editions. The NCC and AS 1668.2-2012 determines where kitchen exhaust hood systems are required, the minimum ventilation rates, the construction details in terms of functionality and hygiene and, importantly, the minimum distances between the grease removal device and the heat source. The NCC and AS/NZS 1668.1-2015 specifies the design and installation precautions that need to be included to mitigate the results of any fire that occurs in the exhaust system.

AS/NZS 1668.1 requires 300mm separation or fire insulation between ducts and combustible materials, and separate shafts for kitchen exhaust ducts from different compartments. Flame barriers (in accordance with UL 1046) are required in hoods under some circumstances, such as when the length of kitchen exhaust ductwork within the building exceeds 10m in length or where exposed flames or embers are part of the cooking process. Where appliances can produce sparks – e.g. solid-fuel ovens – a spark arrestor is required at the connection. Systems that are already operating should not shut down in fire mode.

Where located in a building required to have fire sprinkler protection to AS 2118.1-1999 or AS 2118.4-2012 kitchen exhaust systems must also be protected with sprinklers. Both standards require sprinklers to be installed under kitchen hoods and within kitchen exhaust ductwork.

Figure 5: Access panels every three metres in horizontal graded ductwork.

Pre-engineered fire protection systems:
It is recommended that pre-engineered fire protection systems, in accordance with AS 3772-2008, be installed instead of sprinklers within kitchen hoods to protect cooking equipment such as deep fat fryers, sprinklers are still required in the ductwork. These are typically wet (water/chemical) suppressant based systems that require an alternative solution to meet the requirements of the NCC and should be maintained in accordance with AS 3772.

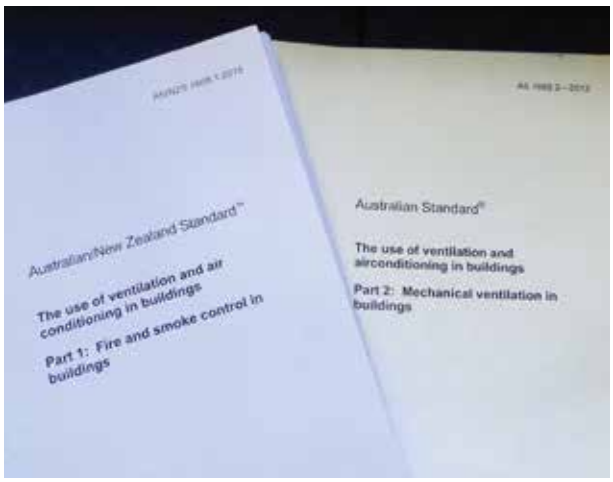


Figure 6: Relevant Australian Standards.

Grease filters

If the cooking process generates grease or oil, and most do, then AS 1668.2 requires that grease filters or grease removal devices are provided to reduce grease entering the exhaust duct. There must be a minimum distance between the grease removal filter and the cooking surface – 1350mm for open-fire cookers (charcoal or wood fires), 1050mm for naked flames (gas cooking), and 600mm for electric plates and rings. Filters should be easily accessible and removable for cleaning and be installed at an angle not less than 30 degrees from vertical.

Grease particles can be broken down into three size categories: grease smoke particles ranging from 0.03 to 0.5 microns, grease steam particles (grease-covered moisture particles) ranging from 0.5 to 6.0 microns, and grease spatter, or larger visible particles ranging from 6.0 to 150 microns. Different filter designs work better for different particle size ranges and not all devices can capture all particle sizes effectively. High temperature cooking processes convert some grease into the gaseous phase which cannot be captured by filters and eventually condenses and accumulates on ductwork walls.

Grease filters can't prevent grease entry into the exhaust system but they can reduce entry and extend the length of time required between duct cleaning.

Ductwork

AS/NZS 1668.1 requires ductwork outside of dedicated fire-resistant shafts or structurally independent fire-resistant enclosures to be manufactured from 1.2mm galvanised steel, 0.9mm stainless steel, or equivalent. Ducts must be vertical where practicable. Ducts that are not vertical must be graded upwards (at least 1:200) in the direction of airflow allowing grease and moisture to drain back towards the hood. Drainage points fitted with a grease tight tap or plug must be provided, as well as access panels/cleanout hatches at each change in direction and every 3m run of (non-vertical) ductwork. Access panels must be airtight and not compromise the fire integrity of the exhaust duct. Joints and seals must be grease tight; fully welded, rivet and soldered, or be sealed with a liquid mastic or sealant that is unaffected by water, grease or cleaning solvents. Flexible connections must be grease tight, grease proof, fire resistant and not longer than 300mm.

Vertical ducts are safer ducts: Horizontal duct runs should be minimised on all systems as there is a high risk of grease build-up and grease leakage in these sections. They also have the potential for the reverse flow of smoke into the kitchen during a fire event. Ducts should be vertical and take a direct route (or as short as possible) to the outside.

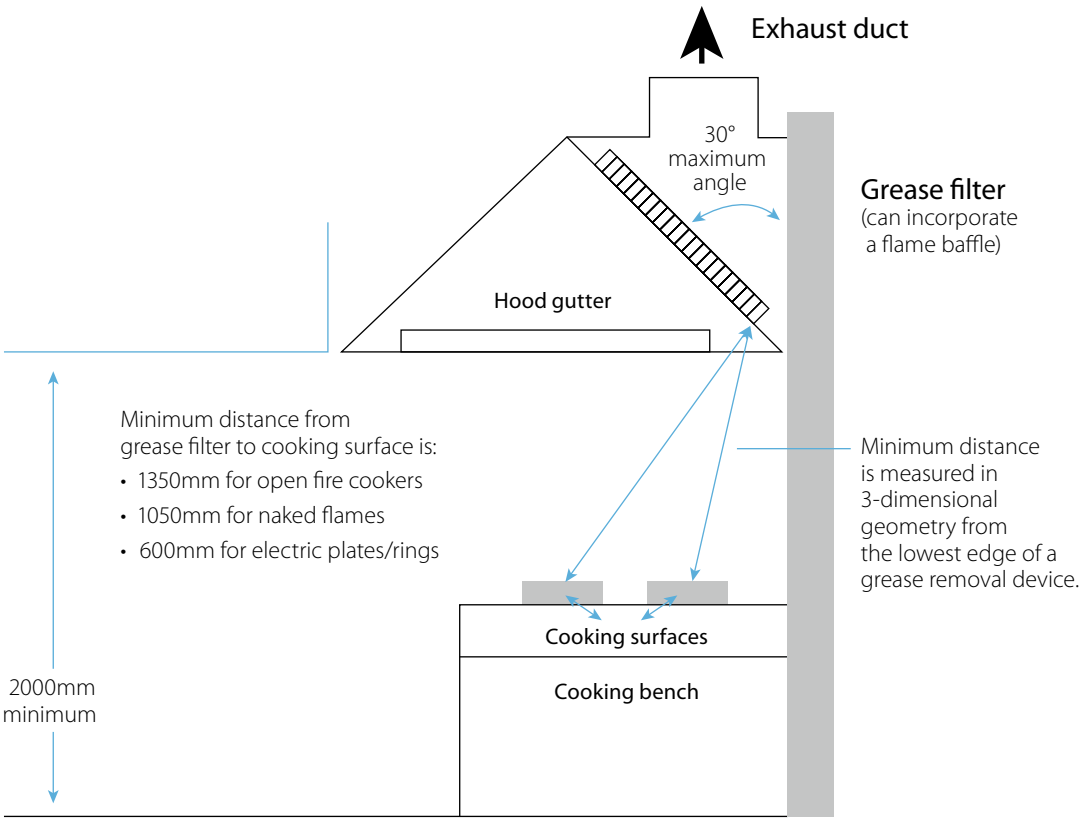


Figure 7: Location and separation distance of grease filters.

5. Seven deadly sins

Correcting common problems for existing systems

The following commonly recurring safety faults are often discovered in commercial kitchen exhaust ventilation systems:

1 Grease removal device too close to the heat source

Unintentional flare-ups from kitchen cooking equipment is the dominant cause of fires in kitchen exhaust hoods and ducts. The further that the grease removal device is installed away from the ignition source, the lower the likelihood that a cooking flare-up will cause ignition within the hood.

AS 1668.2 specifies the minimum distances allowed.

Figure 8: Burnt grease filters.

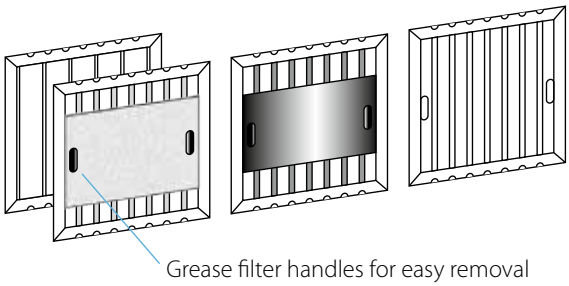


Figure 9: Typical filters and baffles.

2 Poor maintenance/ poor access

Systems that are not periodically inspected, maintained or cleaned will be subject to a build-up of oil, grease and other inflammable materials within the duct, filters, gutters, and on the internal surfaces of the hood. Systems that are not properly maintained present a higher risk of a significant fire event. Systems cannot be adequately inspected or maintained if the cleaning contractor cannot access and clean the internal duct surfaces. AS 1668.2 requires that access panels "large enough to enable cleaning of ducts" are provided in the ductwork at every change in duct direction and at least every 3m for horizontal duct runs.

If access cannot be achieved, the duct cannot be cleaned, and this will generate a significant and ongoing fire hazard.

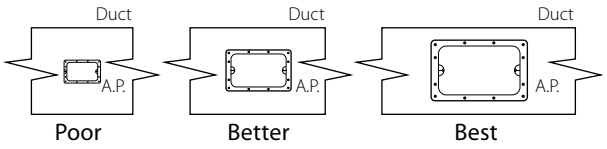


Figure 10: Fire rated access panel must be large enough to facilitate cleaning.

3 Split maintenance responsibilities

In some cases a building owner and a building tenant will have split responsibilities for system maintenance and cleaning, because the hood and filter are located within the tenancy, and the exhaust duct and fan are located in a common or core building area. In these circumstances the scheduled maintenance programs should be coordinated and the individual responsibilities made explicitly clear. Ultimately it is the building owner that holds the regulatory responsibility for fire safety at the premises.

Figure 11: Multi-tenant mixed-use building.

4 Ducts too close to inappropriate materials

Fire insulation must be provided between the exhaust duct and any surrounding combustible materials. Failing to use fire-resistant construction materials or not providing the correct fire separation distances represents a significant fire hazard. Ductwork must be installed at least 300mm away from any combustible material or be insulated to achieve a fire-resistance level (FRL) of –/30/30. Ducts penetrating any fire-rated floors, walls, and ceiling/floor or ceiling/roof systems must be installed so that the required FRL of the building element is not compromised. This generally means that the duct has to be enclosed in a fire rated enclosure or in fire-rated construction.

Other trades or kitchen staff, who are not aware of the danger of locating combustible materials near or on kitchen exhaust ducts, also need to be considered. Hoods and ducts should never be used as storage or shelving space. Signs can be used to educate staff.

Figure 10: Scorched fan.

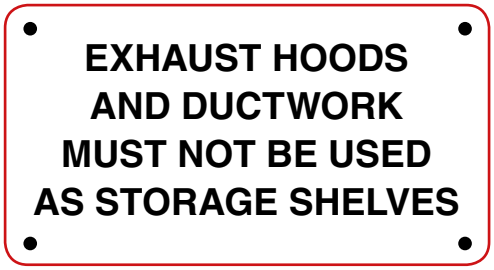


Figure 12: Educational signage.

5 Multiple ducts from multiple compartments

Over time, as a building's configuration or usage changes, kitchen exhaust systems are often extended or added. AS/NZS 1668.1 does not allow kitchens within different fire compartments to share the same exhaust ductwork or fan.

Kitchens in separate compartments must have separate systems with separate fire-isolated shafts, ducts and fans.

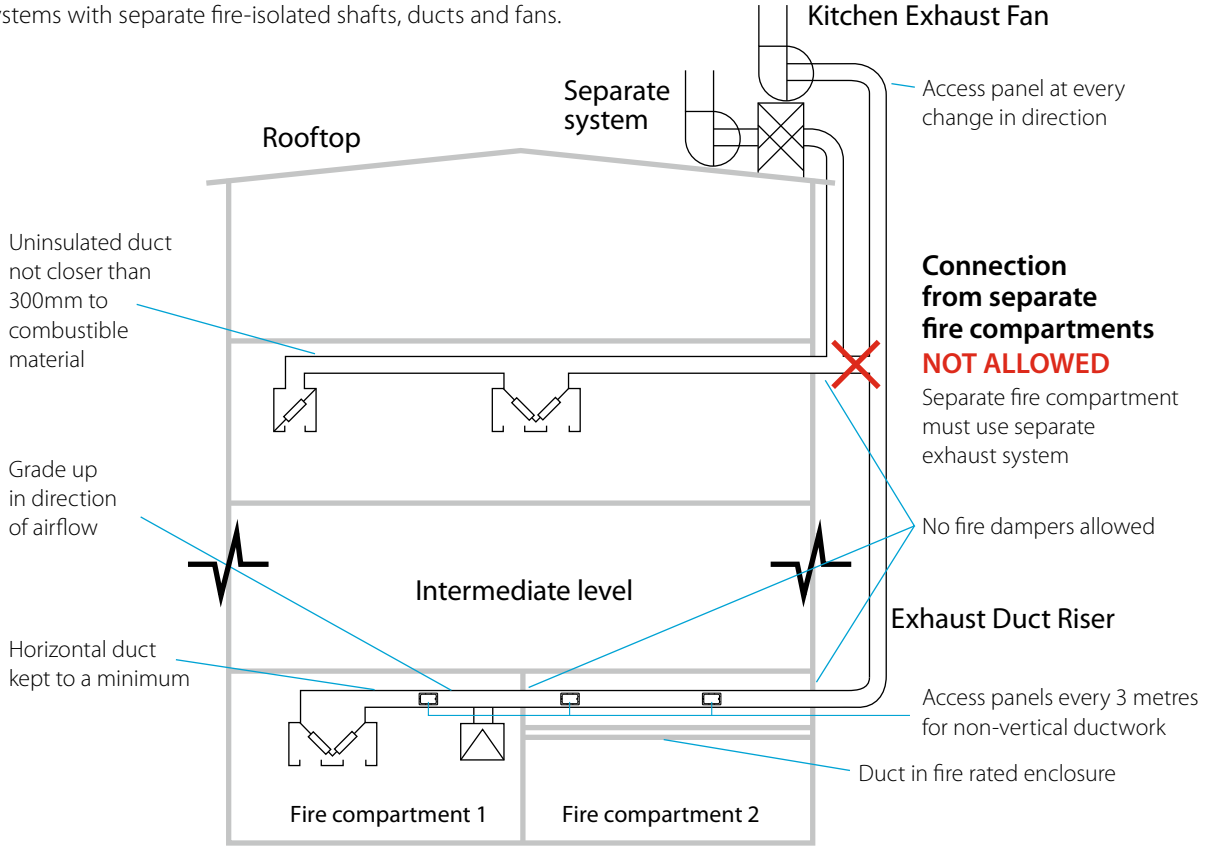


Figure 13: Rules for kitchen exhaust ductwork.

6 Wood-fired ovens and charcoal heaters

Because of the increased ignition risk imposed by solid fuel (wood and charcoal-based cooking fuels), these types of cooking appliances must now be provided with separate, independent ventilation systems and spark arrestors. Existing older systems may combine spark-producing and grease producing cooking appliances within a single system. This high-fire-risk practice should be reviewed and mitigated by installing scrubbers or water sprays in the duct, separating the exhaust systems, or installing a pre-engineered fire-protection system.

Figure 14: Spark arrestor and scrubber.

7 Incorrect installation

Systems may have been incorrectly designed and installed from day one. Ducts should be installed vertically or near-vertically, with horizontal runs graded towards a drain and provided with access/cleanout hatches. Standard-gauge ductwork must not be used; bracing should not promote excessive grease build-up.

Ductwork seams must be grease-tight, otherwise grease will leak out onto ceilings and roofs, generating a secondary fire hazard. Exhaust fan(s) must be able to handle grease build-up, must have the motor and drive located out of the airstream, and be capable of withstanding 1000°C without melting or burning.

Figure 15: Grease leaking from ducts and pooling on roof.

Making systems safe: Pre-engineered fire-suppression systems can be installed in the kitchen hood to provide added protection. Hood filters can be re-designed as fire baffles to reduce flame penetration into the duct. Ducts can be sealed to prevent leaks, and access improved to facilitate cleaning. Fire wrapping new or existing kitchen exhaust ductwork with fire-retardant blanket materials, specially designed for the purpose, can improve fire safety; ensure the duct is fully sealed and airtight prior to wrapping.

These additions or modifications can provide the gold standard in kitchen exhaust safety or be used to help make an unsafe system safe again.

Figure 16: Fire wrapping.

Figure 17: Insulation prevented fire breaking out of this exhaust duct.

6. Ongoing inspection and maintenance

Most Australian states have legislation requiring building owners to maintain fire-safety systems and submit a performance assessment to the relevant authorities each year. Kitchen hoods and associated ductwork are considered fire-safety systems in some states. Owners and operators also have a duty to keep systems clean and safe under work health and safety (WHS) regulations and under the food safety standards for commercial kitchens.

AS 1851-2012 outlines a series of minimum inspection, maintenance and record-keeping activities for the fire and smoke-control features of air-handling systems. It includes protocols for kitchen exhaust systems and any associated fire-protection sprinkler systems.

Manufacturers of kitchen exhaust systems often provide their own inspection and cleaning programs, which may be more stringent or frequent than those in AS 1851. In the event of a fire, failure to comply with these may be deemed as negligent or a failure of duty.

Kitchen operators need to provide access, and in particular system (cooking) shut-down times, to allow these important inspection and cleaning procedures to take place.

DID YOU KNOW?

The US standard ANSI/IKECA C10 and the UK Guide HVCA TR19 Section 7 both provide a publically available standard for cleaning of commercial kitchen exhaust systems. This can be used in maintenance procurement and validation. As well as specifying quantified system inspection procedures, these documents define acceptable cleaning methods for system components, and set post-cleaning acceptance standards.

Scheduled maintenance – keeping systems clean and safe

State regulatory authorities, local council permits, insurance companies, building owners, facilities managers, and landlords all impose maintenance responsibilities on the owners and operators of kitchen exhaust systems. State regulations generally require that the building owner must not fail to maintain fire safety related systems.

The maintenance routines for the exhaust systems and fire sprinklers of a commercial kitchen should at least meet the minimum requirements set out in AS 1851. All of the exhaust system should be inspected during this process including the hoods, all ductwork, all fans, connections and discharge cowls or grilles. AS 1851 does not make provisions for partial system inspection or for cleaning only those system components that are easily (or readily) accessible. Scheduled maintenance should, as a minimum, incorporate the following activities:

Figure 18: Fire rapidly spreading up a vertical kitchen exhaust duct.

Scheduled maintenance routine

Every month:

Perform the following monthly maintenance routine:

- Check grease-arresting filters for excessive grease accumulation. Clean grease filters where required.

  Note: Grease filters can be cleaned in dishwashers or cleaned off-site to manage grease waste disposal.

- Check grease gutters for any excessive grease accumulation.
- Check that grease-arresting filters are secured in position and free of damage.
- Check the internal surfaces of the exhaust plenum behind the filters for excessive grease accumulation. If there is grease accumulations, ensure that air is not bypassing around the filters.

  Note: Filters are the first defence against grease spread. Depending on the type of cooking and the volume of usage the cleaning of grease filters could be required more frequently than monthly, including weekly or even daily.

Figure 19: Checking and cleaning ductwork.

Every 12 months:

Perform the monthly maintenance routine, and the following additional tasks (see note):

- Clean the hood and its exhaust plenum.
- Check for excessive air leaks at grease-arresting filters and replace filters if necessary.
- Check the entire exhaust duct for accumulated grease and clean it where necessary.

Fire protection or suppression systems installed within kitchen exhaust systems may have special requirements requiring additional mandatory maintenance. Only properly trained and qualified personnel should perform this maintenance.

Note: The frequency of the entire exhaust duct system inspection should relate to the usage of the facilities.

HVAC hygiene: Keeping kitchen exhaust systems free from grease build-up also ensures that high HVAC hygiene standards are maintained, which is important in food preparation areas and required by food safety standards and local council regulations. Duct cleaning helps operators meet two regulatory responsibilities: #fire safety and #food hygiene

Apart from the safety and health benefits, improved productivity through more comfortable staff – and reduced energy bills from clean fans and ducts – can also contribute to the bottom line.

BURNING TRUTHS

Fires in kitchens: In Australia, kitchens are reported as the No.1 source of fires in buildings, identified as the source of 25 per cent of all structural fires (up to 50 per cent in commercial buildings). Unattended cooking is the No.1 source of fires in kitchens, and these typically occur directly below the kitchen exhaust hood.

Grease leaks through duct seams: Where horizontal exhaust ducts are incorrectly sealed grease can leak through the seams and soak into false ceiling, bulkhead and roofing materials. This increases the fire hazard and reduces the visual amenity of the kitchen. A grease-soaked kitchen ceiling space contributed to the deaths of two attending fire fighters in a commercial kitchen fire in the USA in 2007. Grease in the ceiling space burned undetected for an hour prior to flashing over violently causing a ceiling to collapse on the fire fighters below.

7. Beyond the minimum standards – Towards best practice

AS 1851 outlines, an agreed inspect/repair/report scheduled maintenance protocol that can be applied to commercial kitchen exhaust systems generally. An owner or facilities manager who uses competent staff who comply with or exceed the AS 1851 routines, is generally regarded as meeting the regulated maintenance requirements and WHS duty. A record of the maintenance process and the inspection results must be kept in case of fire or for insurance purposes.

A better and safer (and indeed best-practice) approach is to tailor the maintenance procedures to reflect both the cooking process in use, as well as the actual usage levels of the kitchen.

Kitchen exhaust systems – best-practice inspection and cleaning means it is OK to exceed the AS 1851 minimum requirements

When to inspect: The frequency of system inspections should relate to the usage of the cooking facilities which the exhaust system serves. For heavy use (12 to 16 hours per day) three-monthly inspections are recommended, for moderate use (six to 12 hours per day) six-monthly inspections are recommended, and for light use (two to six hours per day) 12-monthly inspections may be appropriate.

When to clean: Use a depth gauge/grease comb to identify if there is an unsafe build-up of grease on internal duct surfaces. Readings of up to 0.05mm depth are regarded as a clean surface, readings of up to 2mm depth are acceptable. However, once over 2mm surfaces should be scheduled for cleaning, and any readings over 3mm indicate that immediate cleaning is required.

A service agreement and service certificate should be supplied by the contractor for all cleaning programs including a description of the work, method statements, photographic evidence, and verification results.

Cleaning contractors should be fully insured and provide "before" and "after" photos of the cleaning work. If 100 per cent of the system is not being cleaned, an owner or operator should ask for a drawing that highlights the areas being cleaned, all areas not able to be cleaned, and any improvements to access that could be made to reduce the percentage not cleaned.

Cleaning method options

There are several methods that can be used depending on the system: wet, dry, manual or robotic.

- Manual scraping and manual washing by hand are the most common methods used in Australia.
- Wet washing – using steam or hot water and detergent – is faster and prevalent in the US, but hardly used in Australia due to the poor sealing of the ducts.
- Robotic systems are common in some overseas countries, variously using compressed air (whip/lance/nozzle), rotating brushes, dry ice, vacuum methods, and pressurised water with detergents or degreasers to internally clean the ductwork.

Careful control of water and chemicals is required. In all cases systems must be shut down for cleaning and kitchen operators need to accommodate this. As you would expect, different methods require varying amounts of time to complete.

8. Going the extra mile

Ozone generators and UV treatments can be installed within the system to oxidise any grease and odours that pass the filters. These systems are designed to break down grease molecules through oxidation, resulting in a sooty powder, which is more readily discharged by the exhaust fan. The effect is to significantly reduce levels of deposited grease within the ductwork and fan. These systems can extend the time interval between kitchen exhaust duct cleaning but they must be designed, installed, operated, and maintained strictly in accordance with the manufacturer's instructions.

For these systems to be effective, they must be maintained on a regular basis, the additional cost of maintenance can be offset by the reduced frequency of duct cleaning required and reduced fire risk.

Figure 20: Ozone generators and UV treatments.

Some hoods are designed as self-cleaning hoods and incorporate internal wash-down facilities to automatically remove any grease build-up, again extending the interval between inspections.

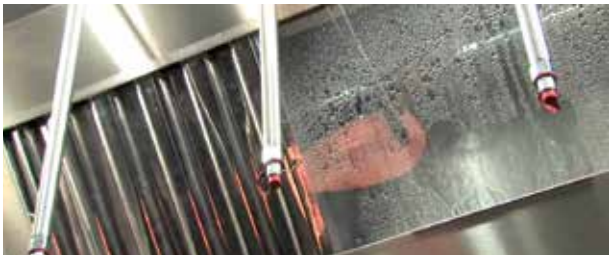


Figure 21: Automatic washdown.

Double skinned, fully welded, fire insulated grease ducts are available and are in common use overseas.

When correctly installed these ducts are:

- safe to locate closer to combustible materials
- can safely contain an internal duct fire
- can facilitate wet washing of internal duct surfaces, either robotically or manually.

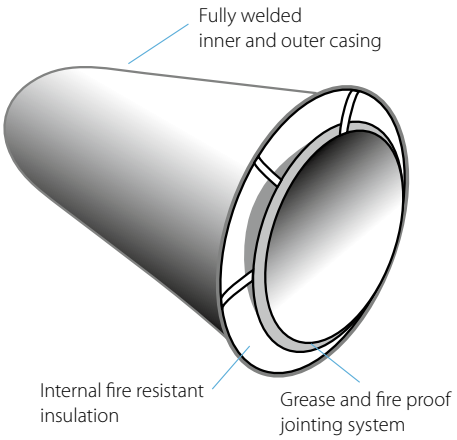


Figure 22: Fire insulated grease duct.

Hinged, roof-mounted exhaust fans can be used. These provide easy access for inspection and maintenance.

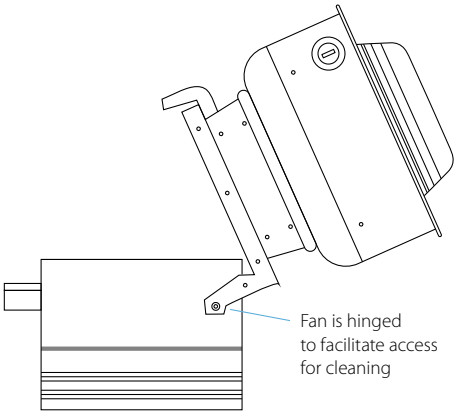


Figure 23: Hinged exhaust fan.

Figure 24: Exhaust fan before and after cleaning.

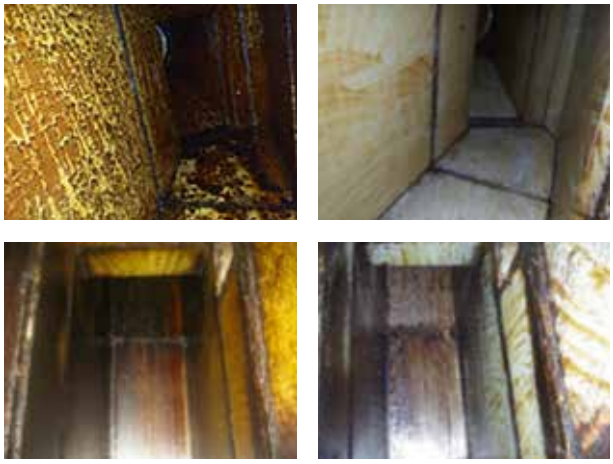


Figure 25: Exhaust ducts before and after cleaning.

9. What can I do?

If you think your kitchen exhaust ventilation system does not meet current standards or represents a fire risk, you should contact an HVAC professional or kitchen exhaust ventilation company to do a fire risk assessment.

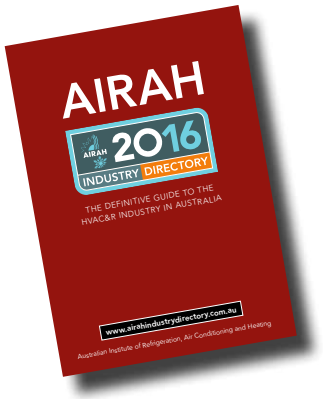


Figure 26: The AIRAH Industry Directory – Australia's definitive HVAC&R industry handbook.

The single most important thing you can do to keep your systems safe is to regularly inspect and keep the system clean.

Make sure you are correctly insured, and discuss with your cleaning contractor any safety hazards or compliance issues in your system.

Safety first: Portable fire extinguishers and fire blankets provide an important first-defence role in kitchen fire safety. Extinguishers should be suitable for use on oil and fat fires, and comply with the Australian Standard applicable to the extinguishing agent used (AS 1841 series).

Never put water on a grease fire. Portable fire extinguishers and fire blankets should be located in accordance with AS 2444-2001. The most popular kitchen extinguisher is dry chemical foam or powder.

Figure 27: Portable fire extinguisher.

10. Further information

AIRAH DA19 HVAC&R Maintenance –
Schedule A18.2 Kitchen Exhaust ducts (and hoods)

Australian Standards AS 1841-2007 series of standards, AS 1668.1-2015 Section 6, AS 1668.2-2012 Section 3 and Appendix E, AS 1851-2012 Section 13, AS 2118.1-1999 or AS 2118.4-2012, AS 3772-2008, and AS 4254.2-2012 Section 2

American National Standards Institute (ANSI) and International Kitchen Exhaust Cleaners Association (IKECA)

ANSI/IKECA C10: Standard for Cleaning of Commercial Kitchen Exhaust Systems

Building & Engineering Services Association Guide to Good Practice TR/19 - Internal Cleanliness of Ventilation Systems

Food Standards Australia and New Zealand the Australia New Zealand Food Standards Code

FPA Australia Good Practice Guide GPG03 Adoption and Use of AS 1851-2012

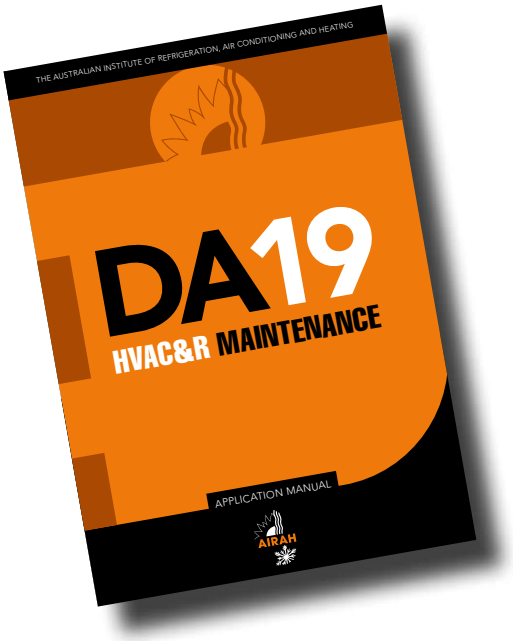
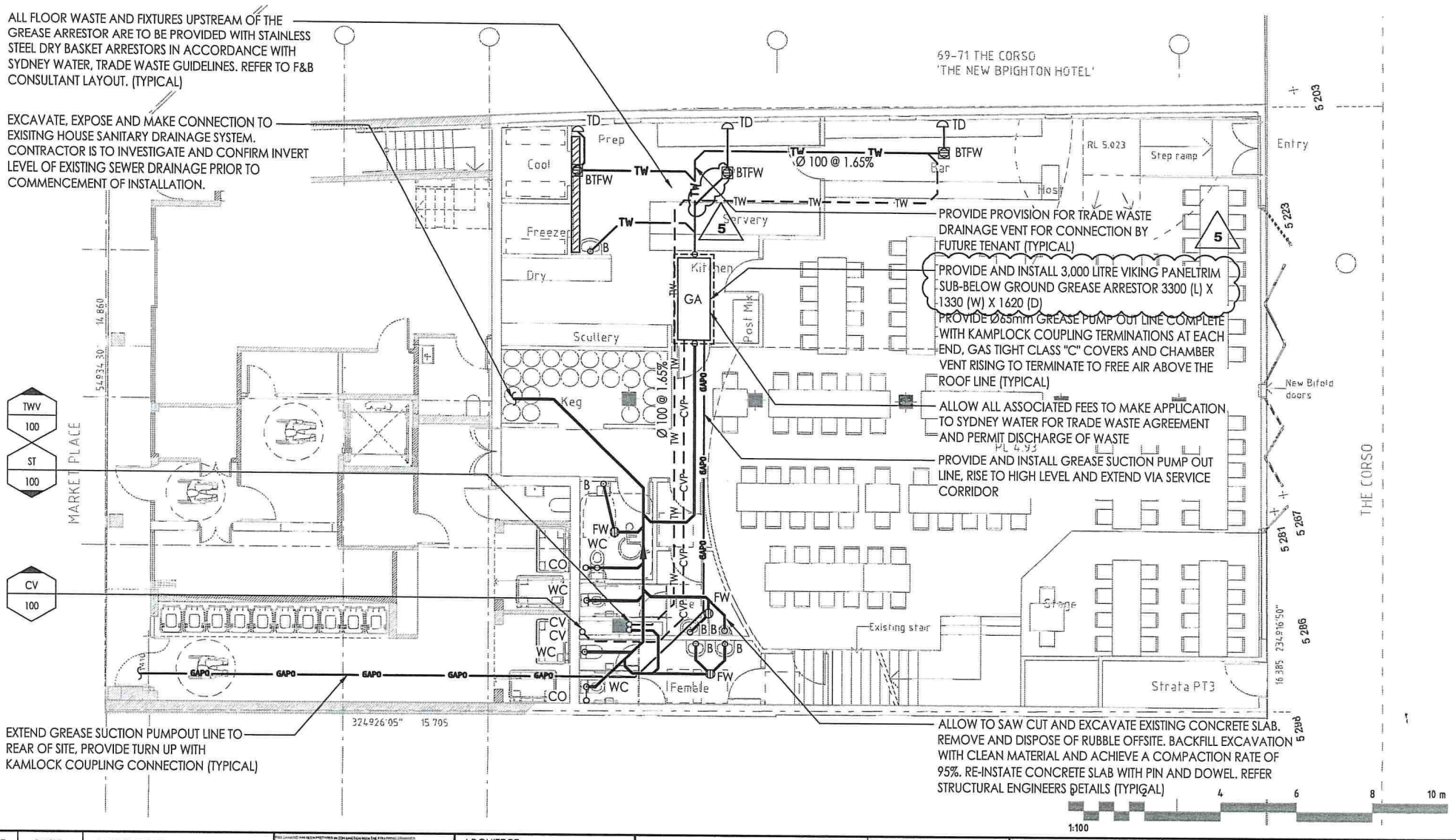


Figure 28: AIRAH DA19 HVAC&R Maintenance manual.



ISSUE	DATE	AMENDMENT
0	20.05.21	TENDER ISSUE
1	31.05.21	TENDER ISSUE
2	01.06.21	TENDER ISSUE
3	30.07.21	TENDER ISSUE
4	03.08.21	TENDER ISSUE
5	01.12.21	TENDER ISSUE

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DRAWING TITLE
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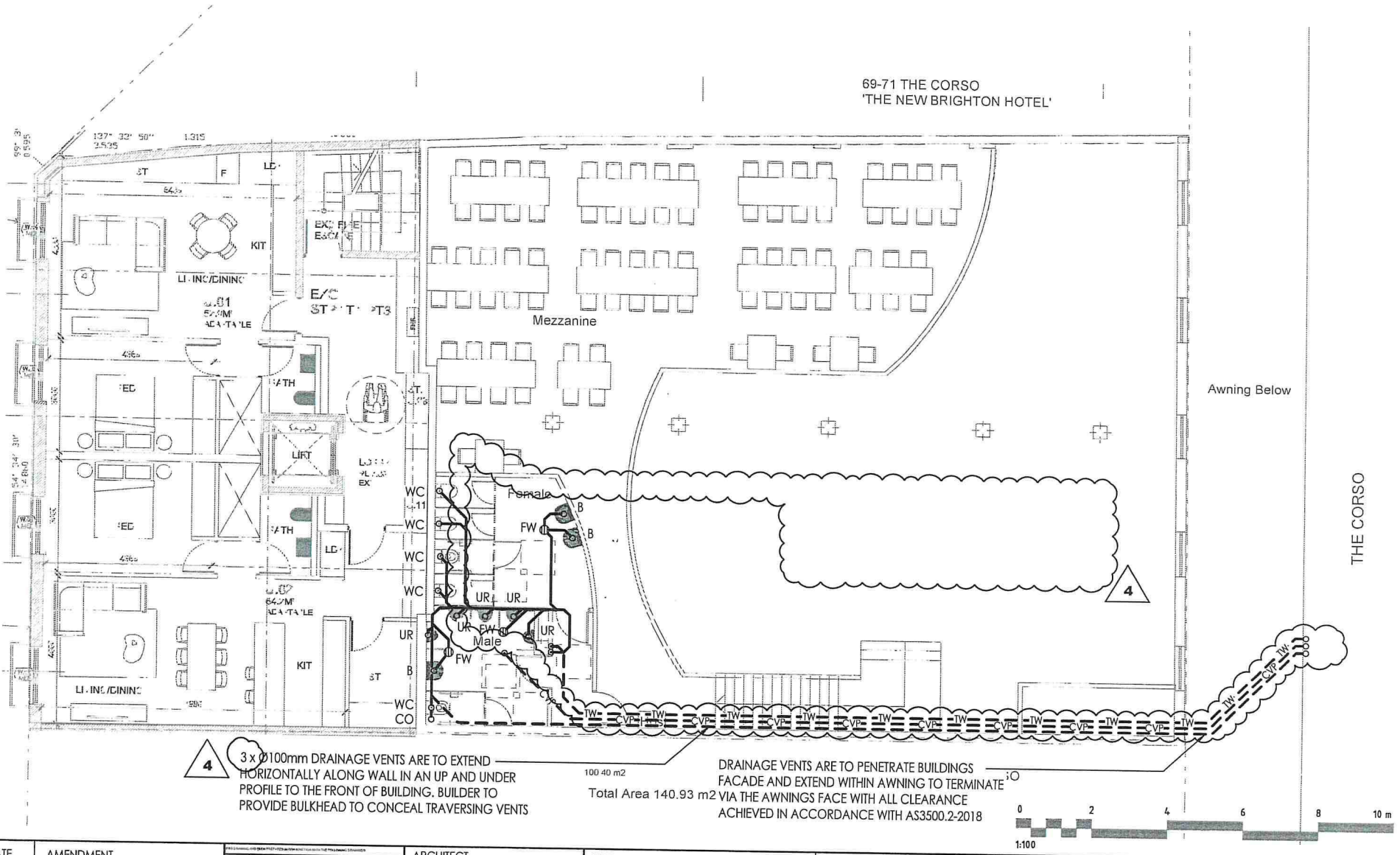
GROUND FLOOR
DRAINAGE LAYOUT

SCALE at A3 1:100
DATE MAY 2021
PROJECT No. SYD21262-H100
DRAWING No.
ISSUE 5



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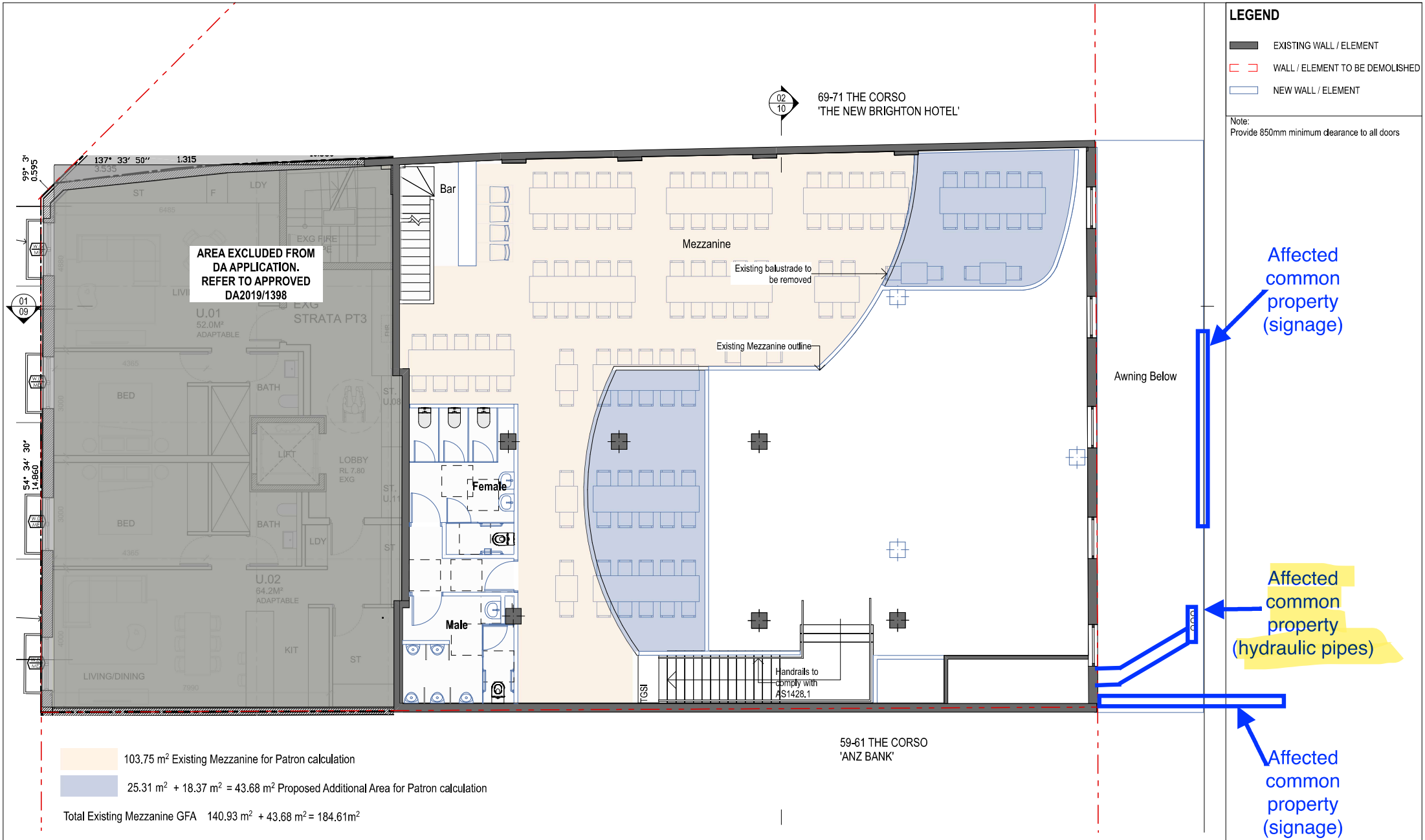
ISSUE 4



SKETCH DESIGN

REV	DESCRIPTION	BY	DATE
01	For Comment		1/12/21

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DRAWING TITLE: PROPOSED MEZZANINE LEVEL

STAGE:

REVISION: 01

SCALE: 1:100, 1:1@A3

PROJECT TITLE: Restaurant Fitout to Ground Floor and Mezzanine level

DWG NO.: DA04