

INDUSTRIAL COMMITTEE

Practice Note 5

REVALUATION 2005

Valuation of subjects containing Clean Rooms

1.0 INTRODUCTION

This practice note applies to the valuation of subjects which contain areas of environmentally controlled space popularly referred to as "Clean Rooms".

2.0 BASIS OF VALUATION

The basis of valuation is the comparative principle as it applies to industrial properties having regard to the costs associated with the provision of additional features necessary to create such subjects. Alternatively in the case of certain purpose built subjects of unique construction as later described, the contractor's basis is recommended.

3.0 ECONOMIC BACKGROUND

Throughout the 80's and 90's there was a marked change in Scottish industry away from traditional engineering skills towards electronics based production. This was largely driven by Government promoted inward investment and was to wholly change the face of Scottish industry during that time. Over the last few years however, there has been a global downturn in demand for micro-chips and associated products largely due to over-production with the result that many companies have contracted back to their national bases resulting in suspension of intended development or whole or partial closure of existing facilities here.

Electronics manufacturers are not however the only users of clean room facilities and the pharmaceutical industry for example remains buoyant.

4.0 CLEAN ROOM DEFINITION

Clean rooms are areas within properties where higher than normal environmental standards are maintained.

A clean room may therefore be defined as an area with environmental control of particulate contamination, temperature and humidity constructed in such a way as to minimise the introduction, generation and retention of particles inside the room.

In terms of structure and internal finish, clean rooms can vary significantly depending on purpose and design. Indeed it is these variations that drive the various classifications set out later in this report. It is noted, however, that particularly in some less sophisticated industries the term *Clean Room* can be applied somewhat loosely to cover accommodation

that amounts to little more than an air conditioned room. For the sake of clarity, accommodation should only be considered suitable for valuation under the terms of this report if, in addition to the presence of environmental control, the accommodation is at the very least characterised by the presence of specialist or specifically adapted floor, wall and ceiling finishes.

5.0 EXPLANATION OF TERMS

The following definitions will assist in understanding features commonly associated with clean rooms and their method of operation.

5.1 Laminar flow

This is the preferred method of air changing and can be either horizontal or vertical. In laminar flow clean rooms, air enters the room through a bank of HEPA filters that comprise the whole of one wall or ceiling and leaves by corresponding ducts opposite. It follows that for effective laminar flow to take place, there must be minimal interruption by pillars, protruding light fittings, inset windows, furniture etc. Vertical laminar flow is likely to be found in only the most sophisticated clean rooms and is clearly superior as lateral contamination is minimised, air being admitted through ceiling filters and extracted through perforated floor tiles.

5.2 Laminar flow clean room

A clean room in which laminar air flow characteristics predominate throughout the entire air space. The direction of flow may be either horizontal or vertical.

5.3 Conventional flow

The air enters the room through a bank of filters positioned such that ducting after final filtration is minimal and leaves the room through outlets remote from the inlets.

5.4 Conventional clean room

This is a clean room in which the air conditioning method does not comply with laminar flow theory.

5.5 HEPA filters

This is an American abbreviation for High Efficiency Particulate Air filters that are the very high specification filters necessary to achieve the environmental standards of the clean rooms that they serve.

5.6 **Air shower**

An enclosed area at the entrance of a clean room with air jets which remove loose particulate matter from personnel prior to entering the clean room.

5.7 **Clean work station, laminar flow bench or cabinet**

These terms describe working enclosures that have their own filtered air or gas supply. These areas may have environmental standards much higher than the clean rooms in which they are located. Such facilities may in themselves be not rateable being self-contained items of plant <400m³.

6.0 **CLEAN ROOM PERFORMANCE**

6.1 **General**

The term *Clean Room* is used to describe a wide range of accommodation varying from areas with simple air conditioning to the most sophisticated forms as can be found in wafer-fabrication plants.

Clean rooms are classified by the cleanliness of their air. This is now done according to ISO 14644-1 which is an international standard adopted by the European Union in 1999 and the USA in 2001. However, the most easily understood classification of clean rooms remains the British Standard (BS) 5295 (1989) equivalent of the obsolete USA Federal Standard 209(E) where the classification is determined by measuring the number of particles >.5 microns in one cubic foot of room air. The metric units used in the Federal Standard 209(E) have never become established. BS5295 (1989) nomenclature therefore continues to be the most widely used and is likely to remain so for many years.

This report will use the BS5295 (1989) basis of classification in the descriptions which follow. The new ISO 14644-1 classifications are however also provided for assistance. Clean rooms are thus described as *Class 1*, *Class 10* etc - a Class 10 clean room for example having not more than 10 particles exceeding 0.5 microns in one cubic foot of air.

It must be emphasised that neither BS5295 nor ISO 14644-1 classifications alone provide a reliable guide to valuation treatment. The air-handling plant in such facilities is generally non-rateable and the above classifications can reflect a number of issues that are not attributable to the physical characteristics of the building. Nevertheless, such information can be an indicator of the structural standard of the facility as there is usually a correlation between the plant and the structure – the best air-handling being found in the best structures.

It is not thought possible to operate a clean room better than Class 100 with human presence and any that do almost certainly require robot technology. It is unlikely that the rateable element of such superior facilities will be better, for reasons of environmental standards alone, than the specified Type 1 facility.

Clean room specifications are continually advancing and surveyors are advised to enquire of the service engineer/facilities manager at any property for the technical details of systems encountered.

6.2 **Critical criteria**

The standard of cleanliness achieved in any clean room depends on a number of factors that include.

1. The structural quality of the clean area and, in particular, of internal wall, floor and ceiling finishes.
2. The efficiency of the air filtration plant and equipment.
3. The control of access/egress to the area and personnel dressing disciplines.
4. The extent to which furnishings, fittings, equipment and materials stored within the area contaminate the environment or interfere with air flow.
5. The extent to which people and materials move within the area.

There is no single most important factor. All of these interact and in order to achieve the highest standards of cleanliness, strict attention requires to be paid in all of these areas. Obviously in terms of valuation for rating, however, it is not appropriate to take into account all of these factors.

It is not uncommon to find two clean rooms of identical natures, perhaps across a corridor from one another in the same property, operating at different cleanliness specifications. This may, for example, be due to different access disciplines on account of process requirements.

The environmental standard alone is therefore not a safe guide to value which should always be based on the (rateable) structural standard of the facility. In this example, the clean rooms should have the same annual value.

7.0 **PROPERTY TYPES**

The report recognises two different forms of subjects containing clean rooms.

7.1 **Wafer-fabrication plants**

These are few in number.

Wafers are made from silicon which is sliced into discs, polished then imprinted with micro-circuitry to be used in all forms of electrical products. Wafer-fab plants have clean rooms of immense scale with air handling plant located in huge plenums above and below the clean room areas. The clean room is sandwiched between these service layers.

The clean rooms are constructed to the highest specifications, which may include for example, vibration free floors. Process requirements may necessitate specialised services usually to be found in an independent utilities building housing sophisticated treatment plant for water and gas, possibly with its own clean areas. The processes may require scrubbing of exhaust gases before release to atmosphere and independent waste-water treatment plants.

The costs associated with these subjects are dramatic and they are constructed in such a specialised way that they do not compare physically with general industrial properties nor are they readily capable of alternative more general use. It is therefore recommended that their unique construction and highly specialised natures be reflected by valuation on the Contractors' Basis using actual or notional costs. Refer to the section on the rateability of service plant. It is also recommended that such subjects be specifically identified by description in the Valuation Roll. The following features are typical of such premises.

Features	Details
Structure	Purpose built facility. Clean room sandwiched between service plenums containing AC ducting. Typical ceiling heights of 3.00 m in clean room, 4.00 m in lower plenum and 8.00 m in upper plenum. Clean room will have large clear span and usually a peripheral viewing corridor. Dust free wall, ceiling and floor linings with welded/sealed joints.
Services	AC will be by vertical or horizontal laminar flow. Clean rooms likely to operate under positive air pressure with sprinkler systems and high intensity lighting systems. There may be special water and gas services from separate services building.
Discipline	Strictest of regimes with operatives fully gowned and gloved and an air showering access procedure.
Typical air conditioning specification	Clean room classifications 100 and 1,000. BS5295 (1989) equivalent classes E-H ISO 14644-1 equivalent classes 5-6.
Costs	Valuation on actual costs preferred but in the absence of costs a figure of £2,000 m ² may be adopted to include the plenum areas.

7.1.1 Technological Obsolescence

Many plants were originally designed to produce 4" and 6" wafers which are now largely obsolete as the industry standard has moved on to 10" and 12" formats. It is not possible to construct the larger wafers in plants designed for the smaller sizes as space for larger machines is required together with different specialised services.

Where a plant or more likely a building within a plant is clearly unused for this reason (and the building may be as little as ten years old), an additional obsolescence allowance may be required to bring the value level down to that

approaching a conventional factory as it is unlikely that the facility will be re-used for its constructed purpose.

7.2 Other subjects containing clean-rooms.

This section is applicable to properties with clean rooms of more conventional design, built on a single level or installed in existing structures. They may be found in all sorts of industrial and similar premises. Generally it will be possible to envisage the shell building being put to an alternative use should the clean room facilities be removed and in these circumstances it is recommended that a comparative approach to value is applied.

Some of these subjects may be very large by comparison with others in the area but this is considered to be an issue of quantum as it applies to large factories valued on the comparative basis and a matter for local assessors, rather than an issue particular to clean rooms.

8.0 CLEAN ROOM CLASSIFICATIONS

Clean Rooms can take many structural forms and in order to simplify matters for valuation purposes this report recognises three principal types.

8.1 Type 1

Feature	Details
Structure	Probably quite large and in a purpose-built building but without the structural specialisation of wafer-fab facilities. Alternative use of the shell building a possibility. Clean room typically with a peripheral viewing corridor, dust free wall, ceiling and floor linings with welded/sealed joints. Laminar flow rooms will be normal.
Services	AC will be by vertical or horizontal laminar flow. Clean rooms likely to operate under positive air pressure with sprinkler systems and high intensity lighting systems. There may be special water and gas services.
Discipline	Strictest of regimes with operatives fully gowned and gloved and an air showering access procedure.
Typical air conditioning specification	Clean room classifications 100 and 1,000. BS5295 (1989) equivalent classes E-H ISO 14644-1 equivalent classes 5-6.

8.2 **Type 2**

Features	Details
Structure	Typically installed in a standard industrial style building but with specialised partitions having dust free finishes, sealed suspended ceilings and welded vinyl floor coverings with upstands.
Services	Positive pressure with entry through a simple air lock. Conventional air flow or basic horizontal laminar flow system. Flush fitting lighting system.
Discipline	Probably less strictly controlled than Type 1 but may still require full body cover.
Typical air conditioning specification	Clean room classifications 1,000 and 10,000. BS5295 (1989) equivalent classes G-J ISO 14644-1 equivalent classes 6-7.

8.3 **Type 3**

Features	Details
Structure	Almost certainly erected within existing space but may well apply to corridor areas of superior establishments. More typically formed by an area partitioned off from normal production space or created from offices. Clean rooms will have dust free linings, suspended ceilings with sealed joints and surface mounted light fittings, welded vinyl floors.
Services	Simple ducted AC systems or banks of free-standing AC units.
Discipline	Direct access from non-specified production or office space. Lab coat requirement only.
Typical air conditioning specification	Clean room classifications 10,000 and 100,000. BS5295 (1989) equivalent classes J-K ISO 14644-1 equivalent classes 7-8.

9.0 **RATEABILITY OF CLEAN ROOMS**

Dependent upon its nature, a clean room structure may be rateable either as part of the building or as an item of plant or machinery. Where a clean room structure is held to be an item of plant, the following comments are provided to assist in determining if it is rateable.

Most clean rooms will be assembled on site using either basic materials or prefabricated parts and as such will take on such an impression of permanence that they can readily be regarded as being plant "in the nature of a building or structure".

A clean room exceeding 400 m³ will be rateable (depending on construction) in terms of Class 4, Table 4 (chambers) and a clean room of smaller capacity will still be rateable provided it is not "readily capable of being moved from one site and re-erected in its original state on another without the substantial demolition of any surrounding structure".

The valuer should be quite convinced that the clean room should be regarded as an item of plant and can be removed and re-erected before conceding rateability. Clean work-stations and laminar flow benches or cabinets installed within general clean room areas may be appropriate items to concede.

10.0 RATEABILITY OF SERVICE PLANT

The approach to the treatment of air-handling plant in clean rooms is governed by the terms of the Valuation for Rating (Plant and Machinery) (Scotland) Regulations 2000.

Class 2 of the Schedule of Prescribed Classes of Plant and Machinery describes as rateable service items including plant used for heating, cooling and ventilating but specifically excludes *"any such plant or machinery which is in or on the lands and heritages and is used or intended to be used in connection with services mainly or exclusively as part of manufacturing operations or trade processes"*.

Note that the term *Air-Conditioning* is not referred to in the Regulations but the services which air-conditioning plant provides such as heating, cooling and ventilating are specifically mentioned.

Careful consideration must therefore be given before removing any service plant from value which it is claimed was installed only as a process requirement. It is suggested that where the main or exclusive use of an item of service plant cannot be identified as being used as part of manufacturing operations or trade processes, then the item should be regarded as rateable under Class 2.

In the case of multi-purpose service plant, the functions of the plant should be individually considered. For example, in the case of an air-conditioning system which provides amongst other things, heating, the use of the heating needs to be identified and unless the heating is used mainly as part of manufacturing operations or trade processes, then an element in respect of heating should be retained in value.

An element should generally be retained in value in respect of comfort heating throughout clean-room areas.

For further assistance in this matter reference should be made to the SAA paper *"Interpretation Guidance: Class 2 Table 2(b) The Valuation for Rating (Plant and Machinery) (Scotland) Regulations 2000"*.

11.0 VALUATION

From an examination of the available evidence, the following percentages are to be applied to the local basic rate and represent the rateable element only.

Clean room type	Addition to Basic Rate
Type 1	+100%
Type 2	+70%
Type 3	+50%

In no case should the final rate applied be allowed to fall below that for production offices of similar structural specification valued from the local comparative scheme.

The additions stated include lighting. Less common services such as sprinklers etc should be added as found.

12.0 AGE & OBSOLESCENCE

Allowances in respect of age and obsolescence should be selected from the following table. Where conversion and upgrading of existing accommodation has taken place to create clean rooms, the allowances should be moderated at the valuer's discretion.

Year	Allowance	Year	Allowance	Year	Allowance
2005	0.00%	1981	19.00%	1957	43.00%
2004	0.50%	1980	20.00%	1956	44.00%
2003	1.00%	1979	21.00%	1955	45.00%
2002	1.50%	1978	22.00%	1954	46.00%
2001	2.00%	1977	23.00%	1953	47.00%
2000	2.50%	1976	24.00%	1952	48.00%
1999	3.00%	1975	25.00%	1951	49.00%
1998	3.50%	1974	26.00%	1950	50.00%
1997	4.00%	1973	27.00%	1949	50.00%
1996	4.50%	1972	28.00%	1948	50.00%
1995	5.00%	1971	29.00%	1947	50.00%
1994	6.00%	1970	30.00%	1946	50.00%
1993	7.00%	1969	31.00%	1945	50.00%
1992	8.00%	1968	32.00%	1944	50.00%
1991	9.00%	1967	33.00%	1943	50.00%
1990	10.00%	1966	34.00%	1942	50.00%
1989	11.00%	1965	35.00%	1941	50.00%
1988	12.00%	1964	36.00%	1940	50.00%
1987	13.00%	1963	37.00%	1939	50.00%
1986	14.00%	1962	38.00%	1938	50.00%
1985	15.00%	1961	39.00%	1937	50.00%
1984	16.00%	1960	40.00%	1936	50.00%
1983	17.00%	1959	41.00%	1935	50.00%
1982	18.00%	1958	42.00%	1934	50.00%

