



Green Mark 2021

Hw

Health and Wellbeing

The Health and Wellbeing section looks at the design, construction, operation and retrofit of buildings that facilitate mental, physical, and social wellbeing of their occupants. On average we spend more than 90% of our time within buildings, which is why designing for health, and wellness is increasingly important.

The GM 2021 Health and Wellbeing section (Hw) has been co-created with the Ministry of Health Office for Healthcare Transformation (MOHT) and the Centre for Liveable Cities (CLC), allowing the translation of leading evidence-based health and physical environment research, to the development of robust health and wellbeing indicators for the built environment.

The section has been refined by a rigorous process involving experts in the field, inputs from agencies with key roles in administering environmental health, workplace and welfare standards and our Singapore Green Building Council.

Projects that are certified under the WELL Building Standard will receive recognition and some exemption under the Green Mark 2021 Hw section. Table HW 0.1 WELL Certification provides the details.



Helps projects meet targets under the following SDGs



HEALTH AND WELLBEING

HW1 Physiological	Green Mark Points	
HW1.1 Active Movement Design	New	Existing
<p>HW1.1a Active Mobility The project must support and promote active mobility.</p> <p>(i) <u>Safe Access In and Around the Project Site</u> The project shall protect the visitors, users and occupants through design for safe access and movement to and around the site. Provision of safe and segregated access for pedestrians and cyclists with vehicular traffic with direct connections to cycle lanes and footpaths.</p> <p>(ii) <u>Bicycle Lots</u> Provision of secure and sheltered bicycle lots that are 50% more than the LTA/URA requirement, with associated shower, changing and locker facilities</p> <p><i>Refer to the URA-LTA Walking and Cycling Design guide</i></p>	<p>1 point (0.5 for (i) and 0.5 (ii))</p>	<p>2 points (1 for (i) and 1 (ii))</p>
<p>HW1.1b Active Interior</p> <p>(i) <u>Internal Staircases</u> Active interiors, with internal staircases that are highly visible, appealing, well ventilated and prominent allowing connections between multi-storey spaces or tenancies.</p> <p><i>The building must either provide the stairs or have the provision of a space for stairs to be installed in the future without significant demolition,</i></p> <p><i>For residential buildings the common staircases shall be designed to encourage their use through attractive wayfinding and design including stair finishes, use of colour and lighting and finishes.</i></p> <p>(ii) <u>Active Furnishing</u> Provision of active furnishing to discourage sedentary behaviour (e.g. standing tables and height-adjustable desk), decentralised common areas, standing meeting rooms etc.</p>	<p><u>Non-Residential:</u> 1 point (all floors) OR 0.5 point (at least 50% of the floors)</p> <p><u>Residential:</u> 1 Point 1 point (all floors) OR 0.5 point (at least 10 floors, including basement(s) and ground floor)</p> <p><u>Non-Residential:</u> 1 point (at least 90% of all workstations) OR 0.5 point (at least 50% of all workstations)</p> <p><u>Residential:</u> Not applicable</p>	<p><u>Non-Residential:</u> 1 point (all floors) OR 0.5 point (at least 50% of the floors)</p> <p><u>Residential:</u> 1 Point 1 point (all floors) OR 0.5 point (at least 10 floors, including basement(s) and ground floor)</p> <p><u>Non-Residential:</u> 1 point (at least 90% of all workstations) OR 0.5 point (at least 50% of all workstations)</p> <p><u>Residential:</u> Not applicable</p>

HW1.2 Material Emissions		
<p>Material Finishes to be SGBC 4 tick.</p> <p>OR</p> <p>Meet following emission levels stated in Table HW1.2.1:</p> <p>Materials include paints, floor coverings, wall coverings, ceiling coverings such as carpets, paints, adhesives, engineered timber (including laminates), for carpentry works and furniture where provided. See Table HW1.2.2 for details.</p> <p><i>* includes lettable areas for non-residential developments and dwelling units for residential developments</i></p>	<p><u>Non-Residential:</u> 1 Point (≥60% of all areas*) OR 0.5 Point (≥80% common areas)</p> <p><u>Residential:</u> 2 points (≥60% of all areas*) OR 0.5 Point (≥80% common areas)</p>	<p>1 point (≥80% common areas)</p>
HW1.3 Air Quality and Comfort		
<p>HW1.3a Thermal Comfort</p> <p>Provide a range of thermally comfortable spaces. This means that the building systems allow for a variability of temperatures, and greater ability to adjust to individual preferences</p> <p>(i) <u>Air-Conditioned Non-residential Buildings:</u> zonal temperature and air speed controls. The building can adjust temperature and air speed so that parts of the building can have a thermal variation within it. Control zones should not exceed 100m²</p> <p><i>Strategies include</i></p> <ul style="list-style-type: none"> <i>The use of hybrid cooling systems with elevated temperatures with provision of ceiling fans and/or individual desk fans. Where comfort can be controlled by the temperature of conditioned air and the windspeed variation</i> <i>Spatial and zonal temperature monitoring with occupant feedback, controls to allow for adjustable air speeds and temperatures in discrete zones in open areas or by room</i> <p>(ii) <u>Residential Buildings and Non-Residential Non-Air-Conditioned functional spaces</u></p> <p>a. <u>Thermal Comfort Simulation</u> -0.5<PMV<0.5</p> <p>b. <u>Effective Cross Ventilation</u> 70% of habitable areas to meet the Area weighted average wind velocity of 0.6m/s</p> <p>c. <u>Prescriptive Performance</u> as table HW1.3</p> <p><i>For draft sensitive sports spaces, or industrial buildings with occupancy densities less than 50m² per person, projects can meet the following requirements in lieu of a) and b):</i></p> <ul style="list-style-type: none"> <i>Air Change rate ≥ 10</i> <i>Air Change Effectiveness ≥ 1.2</i> 	<p>1 point</p> <p><u>Non-Residential:</u> 1 point</p> <p><u>Residential:</u> 3 points</p>	<p>1 point</p> <p><u>Non-Residential:</u> 1 point (based on measurements)</p> <p><u>Residential:</u> N/A</p>

<p>HW1.3b Outdoor Air Provision</p> <p>(i) Enhanced Outdoor Air Provision Outdoor air provision greater than ventilation rates in SS553, with demand control and monitoring systems.</p> <p>a. Outdoor air supply at 1.5 times minimum ventilation rate required in SS553</p> <p>b. Outdoor air supply at 2 times minimum ventilation rate required in SS553</p> <p>(ii) Periodic (Post) Occupancy Evaluations At least once every 3 years</p> <p>(iii) IAQ Surveillance Audit By an accredited laboratory once every 3 years or annually</p>	<p><u>Non-Residential:</u></p> <p>1 Point</p> <p>2 Points</p> <p>0.5 point</p> <p>0.5 point (once every 3 years) OR 1 point (annual)</p> <p><u>Residential:</u> N/A</p>	<p><u>Non-Residential:</u></p> <p>1 Point</p> <p>2 Points</p> <p>0.5 point</p> <p>0.5 point (once every 3 years) OR 1 point (annual)</p> <p><u>Residential:</u> N/A</p>
<p>HW1.3c Clean Air</p> <p>(i) UVGI system for air disinfection</p> <p>(ii) Air filtration with permanent provision of ePM1 ≥75% (ISO 16890) [or alternatively at least MERV 14A (ASHRAE 52.2 Appendix J)] media filters</p> <p>OR</p> <p>Permanent provision of adequate portable air cleaners with HEPA filters for non-air-conditioned functional spaces</p> <p>(iii) Provide Designated Smoking Points for smokers to use, to allow non-smokers to utilise outdoor spaces in a healthy manner.</p> <p><i>NEA laws Under the Smoking (Prohibition in Certain Places) Act detail places where smoking is prohibited. Additional house rules or by-laws put in place by owners/managers of premises against smoking in their premises are permitted and allow for HW1.3c (iii) to be realised.</i></p> <p><i>Refer to https://www.nea.gov.sg/docs/default-source/our-services/smoking-prohibition/9-dsa-guidelines_cleared.pdf for guidance on location of designated smoking points and areas.</i></p>	<p><u>Non-Residential:</u></p> <p>0.5 point</p> <p>1 point</p> <p>0.5 point</p> <p><u>Residential:</u></p> <p>1 point for (iii)</p>	<p><u>Non-Residential:</u></p> <p>0.5 point</p> <p>1 point</p> <p>0.5 point</p> <p><u>Residential:</u></p> <p>1 point for (iii)</p>
<p>HW1 Physiological</p>	<p>5 Points total</p>	

HEALTH AND WELLBEING

HW2 Psychological	Green Mark Points	
HW2.1 Access to Nature	New	Existing
<p>Direct connection to plants, water, light or nature views; Indirect connection via natural materials, patterns, art; Placement of natural elements along common circulation routes, shared seating areas, workstations</p> <p>(i) Provision of accessible planted sky terraces, courtyards, and roof top gardens.</p> <p>(ii) Fixed indoor planting distributed at key common areas. >10% of common area (by floor Area) to have fixed indoor planting, and/or ponds.</p> <p>(iii) Placement of natural elements, and use of mixed textures in key common areas such as atria, entrance lobbies, shared seating areas, and key circulation routes.</p> <p>(iv) In the absence of indoor or accessible planting, to orientate and design common areas for direct visual access to greenery.</p> <p>Reference: World Health Organisation, Urban Green Spaces and Health: A review of evidence.</p>	<p>1 Point</p> <p>0.5 point</p> <p>0.5 point</p> <p>0.5 point</p>	<p>1 Point</p> <p>1 point</p> <p>0.5 point</p> <p>0.5 point</p>
HW2.2 Circadian Rhythm		
<p>Ensuring lighting is aligned with circadian rhythm with day-night cycle with access to views to the outside.</p> <p>(i) Views to the outside Functional spaces are within 8m distance from a window, without obstruction.</p> <p>(ii) Quality of Artificial Lighting</p> <ul style="list-style-type: none"> • Colour Rendering Index • Responsive Light Control <p>(iii) Circadian Lighting System Provision of shifts in colour temperature to match the progression of the day:</p> <ul style="list-style-type: none"> • Task Lighting • All Lighting 	<p><u>Non-Residential</u></p> <p>1 Point</p> <p>0.5 Point</p> <p>2 Points (1 Point for task lighting, 2 Points for general lighting)</p> <p><u>Residential:</u> 2 Points for relevant common area lighting</p>	<p><u>Non-Residential</u></p> <p>1 Point</p> <p>0.5 Point</p> <p>2 Points (1 Point for task lighting, 2 Points for general lighting)</p> <p><u>Residential:</u> 2 Points for relevant common area lighting</p>

HW2.3 Sound		
<p>HW2.3a Sound Zoning Design Approach</p> <p>Implement passive and/or active acoustic control measures to minimise exterior sourced noises by creating positive soundscapes through</p> <ul style="list-style-type: none"> • Orienting and locating noise-sensitive buildings and spaces away from exterior sourced noises. using less noise-sensitive spaces (e.g. MSCP, pedestrian/cycling pathways) as buffers from exterior sourced noises, • Natural or engineered barrier (balconies, toilets/kitchen, dense landscaping) <p>The criteria under HW2.3a promotes design and implementation strategies, including aspects like orientation and location of noise-sensitive areas within the plots/parcels. Should pay attention to acoustic control through site design.</p> <p>Refer to technical guide for useful references</p>	0.5 point	0.5 point
<p>HW2.3b Interior Acoustic Comfort</p> <p>Implement acoustic control measures to minimise acoustic discomfort internally.</p> <p>(i) Impact Sound Insulation (residential buildings) Compliance with Table HW2.3.1 otherwise per BB93 or HTM08-01</p> <p>(ii) Noise from External Noise Sources (e.g. Land Traffic)</p> <p><i>Applies to internal noise levels for closed façade condition only (i.e. all normally operable windows and doors to outside are closed)</i></p> <p><u>Residential</u> Internal noise levels to comply with AS2107:2016</p> <p><u>Non-residential</u> Internal noise levels to comply with SS553 Amendment 1 noise criteria, otherwise per AS2107:2016, BB93 or HTM08-01</p> <p>(iii) Airborne Sound Transmission Reduction (non-residential buildings) Compliance with Table HW2.3.2 otherwise per BB93 or HTM08-01</p> <p>(iv) Reverberation Time (non-residential buildings) Compliance with Reverberation Time criteria provided in Table HW 2.3.3 otherwise per AS2107:2016, BB93 or HTM08-01</p> <p><i>Acoustic design and verification reports can be used to demonstrate full compliance. Refer to Table HW2.3.4</i></p>	<p><u>Residential:</u></p> <p>(i) 1.5 points (ii) 0.5 point</p> <p><u>Non-Residential:</u></p> <p>(ii) 0.5 point (iii) 0.5 point (iv) 1 point</p>	<p><u>Residential:</u></p> <p>N/A</p> <p><u>Non-Residential:</u></p> <p>(ii) 0.5 point (iii) 0.5 point (iv) 1 point</p>
HW2 Psychological	5 Points total	

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HW3 Sociological	Green Mark Points	
HW3.1 Inclusive	New	Existing
Certification through BCA Universal Design Mark <ul style="list-style-type: none"> UD Mark Gold UD Mark GoldPLUS 	1 Point (Gold) 2 Points (Gold ^{PLUS})	<u>Non-Residential:</u> 1 Point (Gold) 2 Points (Gold ^{PLUS}) <u>Residential:</u> N/A
HW3.2 Communal Spaces		
HW 3.2a Restorative and community Spaces Healthy environments should be designed with a range of spaces catering for a broad spectrum of human activities that are suitably adaptable for collaborating, resting and relaxing, or community bonding. The provision of such spaces especially in a working environment help reduce stress, provide places of focus and refuge for occupants <ul style="list-style-type: none"> (i) Designated indoor and/or outdoor space for restorative practices (minimum 16m² per space, and large enough for meditation/yoga or just quiet respite) which are accessible for all building occupants (ii) Provision of community spaces and facilities, within the development, including physical exercise facilities, playgrounds, communal gardens / allotments/ sensory spaces, 	<u>Non-Residential:</u> 2 points (1 point for (i) 1 point (ii)) <u>Residential:</u> 2 points for (ii)	<u>Non-Residential:</u> 2 points (1 point for (i) 1 point (ii)) <u>Residential:</u> 2 points for (ii)
HW3.2b – Outsourced Workers Provision of proper and reasonable rest areas for Outsourced workers (e.g. security officers, cleaners) to rest, recuperate, and eat. Refer to the ‘Tripartite Advisory on Provision of Rest Areas for Outsourced Workers’ (Dec 2019): <ul style="list-style-type: none"> (i) Locations that afford privacy and provides a pleasant environment and (ii) Provision of amenities such as tables, chairs, water coolers, lockers. 	1 point	1 point
HW3.3 Health and Wellness programmes		
HW3.3a Physical Activity and Mental Wellness Programmes Structured, regular fitness and mental wellness programmes for all staff, or occupants (at least 6 sessions a year) through engagement of external facilities and resources e.g. subsidised gym memberships, health assessments, personal training, fitness classes, mass workouts, talks and workshops, counselling.	<u>Non-Residential:</u> N/A <u>Residential:</u> N/A	<u>Non-Residential:</u> 1 point <u>Residential:</u> N/A

<p>HW3.3b Healthy Eating & Drinking</p> <p>Create a healthy food environment through provision of facilities, programmes and policies</p> <ul style="list-style-type: none"> (i) Accessible drinking water points at convenient locations (ii) On site eateries with HPB's healthier dining programme (iii) Corporate policies on healthy eating including catering procurement policies <p><i>Convenient locations include (but not limited to)</i> <u>Residential</u> – near playgrounds, recreational areas, sports courts and fitness areas. <u>Non-residential</u> – internally within common areas near WC's, changing rooms, and circulation nodes. Externally in accessible landscape areas, playgrounds and recreational spaces</p>	<p><u>Non-Residential:</u></p> <ul style="list-style-type: none"> (i) 0.5 point (ii) 0.5 point (iii) 0.5 point <p><u>Residential:</u></p> <ul style="list-style-type: none"> (i) 1 point 	<p><u>Non-Residential:</u></p> <ul style="list-style-type: none"> (i) 0.5 point (ii) 0.5 point (iii) 0.5 point <p><u>Residential:</u></p> <ul style="list-style-type: none"> (i) 1 point
<p>HW3 Sociological</p>	<p>5 Points total</p>	

HW - INNOVATION

	Green Mark Points	
	New	Existing
<p>Where projects can demonstrate substantial performance to a specific health and wellbeing indicator, or outcome innovation points can be awarded on a case by case basis. Points shall be awarded based on the strength of evidence of benefits and potential impact.</p> <p><u>Process:</u></p> <p>At Design / Pre-retrofit stage The project team is to submit a concise summary that articulates:</p> <ul style="list-style-type: none"> The nature of the environmental benefit of their intervention Justify the impact of the intervention through detailed calculations and comparisons with industry norms Substantiate the calculations and comparisons with evidence and data. <p>At Verification (As Built/ In Operation): Details of the implemented intervention including measurements and monitoring of the environmental performance including lessons learnt if the intervention does not perform as expected.</p>	2 Points	2 points



TABLE HW 0.1 WELL CERTIFICATION

WELL Certification		WELL Core Certification	
WELL Rating	GM Hw Points	WELL Rating	GM Hw Points
WELL Bronze	6	WELL Core Bronze	4
WELL Silver	8	WELL Core Silver	6
WELL Gold	12	WELL Core Gold	8
WELL Platinum	15	WELL Core Platinum	10

NOTES:

- Projects that have attained WELL certifications would be accredited the respective Green Mark points in the Health and Wellbeing section.
- Projects that have attained WELL Gold or WELL Platinum (core assessment) will also be awarded the Health and Wellbeing badge recognizing their exemplary performance.
- For projects that have attained lower WELL ratings, additional points can be attempted within the Health and Wellbeing section to achieve the Health and Wellbeing badge, that are not duplicated in the WELL Certification criteria.

TABLE HW1.2.1

Material Emissions Requirements for non SGBC 4 tick labelled products

For products, finishes and furnishings	<ul style="list-style-type: none"> • TVOC emission rate shall be $\leq 0.25 \text{ mg m}^{-3} \text{ h}^{-1}$ after 24 hours • Formaldehyde emission rate shall be $\leq 0.02 \text{ mg m}^{-3} \text{ h}^{-1}$ after 48 hours
Paints, Varnishes, lacquers,	<ul style="list-style-type: none"> • VOC content for trim, stains and varnishes shall be $\leq 75 \text{ gL}^{-1}$ • VOC content for paints (water-based) shall be $\leq 25 \text{ gL}^{-1}$ for matt, $\leq 30 \text{ gL}^{-1}$ for low sheen, $\leq 75 \text{ gL}^{-1}$ for semi-gloss
<p><i>Limits for products are based upon ASTM D5116-90, "Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products".</i></p> <p><i>Test methods for paints and coatings shall comply with ISO 17895 or ISO 11890</i></p> <p><i>Testing must be by an accredited laboratory.</i></p>	

TABLE HW1.2.2

Material Emissions Application

Area	Description
Flooring, wall and ceiling finishes	<p>Applicable internal finishes include:</p> <ul style="list-style-type: none"> • Adhesives and sealants used for the flooring, wall or ceilings (including tile grouts and sealants, carpet adhesives, wall covering adhesives.) • Floor coverings such as carpets, laminates and vinyl's • Wall coverings such as laminates, fabrics and wall papers • Ceiling coverings such as ceiling boards • Varnish, stains, lacquers, paints or other finishes
Furniture and carpentry	<p>Where provided:</p> <ul style="list-style-type: none"> • Desks • Chairs • Cabinetry including wardrobes, kitchen, pantry and bathroom cabinets. • Cubicle partitions
Doors	Paints, Varnishes, lacquers, or other finishes

TABLE HW1.3

Natural Ventilation Prescriptive Performance		
Parameter	Description	Points
Openings towards prevailing wind directions	0.1 point for every 10% of room openings facing the prevailing winds.	<u>For Non-Residential Buildings</u> 0.5 Point <u>For Residential Buildings</u> 1Point
Non-Residential Buildings Depth of Room vs Openings	<p><u>A. Single sided ventilation:</u> the limiting depth(W) for effective ventilation is twice the floor-to-ceiling height (H) [$W \leq 2H$]</p> <p><u>B. Cross Ventilation:</u> the limiting depth(W) for effective ventilation is five times the floor-to-ceiling height (H) [$W \leq 5H$]</p> <p><u>C. Atria/ event space:</u> Atria to have an effective opening >10% floor area: Atria can be 1.5x the depth of room (A and B), or up to 2x depth where the use of fixed air movement technologies are employed (e.g. HVLS fans).</p>	0.5 point where $\geq 50\%$ of applicable spaces meet 1 point where $\geq 70\%$ of applicable spaces meet.
Residential Dwelling Unit Cross ventilation	Plan level analysis based on the number of living rooms, bedrooms, home office spaces that are designed with true cross ventilation.	0.5 point for $\geq 50\%$ 1 point for $\geq 60\%$ 2 points for $\geq 70\%$ 3 points for $\geq 75\%$

TABLE HW2.3.1**Impact Sound Transmission Reduction Requirements**

Area	Performance (IIC)
Floors between residential spaces such as bedrooms, living rooms and lounges.	≥50

Floors separating enclosed and fully vertically adjacent wet areas (e.g., bathrooms) are not subject to the impact sound insulation requirements

TABLE HW2.3.2**Sound Transmission Reduction Requirements**

Area	Performance (STC)
General Office Spaces	≥45
Any spaces where confidential or critical speech is required examples include, Meeting Rooms, Conference Rooms, Classrooms	≥50-60
Between Mechanical/ Equipment spaces and occupied spaces	≥55

The above reduction requirements apply to partitions between rooms.

For partitions with doors or significant glazing between rooms and corridors/general office areas the above criteria do not apply, however doors and glazing systems shall be specified as minimum STC 35 and the designer is to consider overall room-to-room sound level difference and flanking paths.

TABLE HW2.3.2

Reverberation Requirements		
Area	Description	Reverberation Time
Office	Open Plan Office Conference Meeting Room (small) Video/Audio Conference rooms	0.4 – minimised for noise control 0.6-0.8 <0.6 0.2-0.4
Institutional, Community and civic spaces	Classrooms Conference Rooms Libraries Music Practice Rooms Assembly Halls (up to 250 seats) Sports Halls	0.3-0.7 0.6-0.7 <0.6 0.7-0.9 0.6-0.8 0.7-2
Hotel	Meeting Room Banquet Room/Hall	0.6-0.8 <1.2 should be minimised for noise control
Atria, commercial lobbies	Retail, office, institutional, or hotel atria or main lobby spaces	(reduce as far as practicable for noise control)
<p><i>AS/ NZS 2107 (2016) 'Acoustics – Recommended design sound levels and reverberation times for building interiors' Standards Australia</i></p> <p><i>BS 8233 (2014) 'Guidance on sound insulation and noise reduction for buildings'; British Standards Institution</i></p>		

TABLE HW2.3.4

Acoustic Design and Verification report

Design Report:

Executive Summary – Summary of the key design recommendations for the project

Acoustic Considerations:

- (1) Impact of the project on the immediate noise environment, especially noise sensitive accommodation, including both the construction and operational stages of the building.
- (2) External noise sources and propagation affecting the development
- (3) Internal noise sources, acoustical design and criteria used within the building
- (4) Internal layout planning, finishes selection and acoustical performance of the building
- (5) Site massing, landscaping and facades design to mitigate the adverse impacts of external noise

Facade Noise Ingress Control Criteria:

- (1) Noise survey methodology and standards
- (2) Results
- (3) Recommendations for façade treatment & spatial arrangement of interior spaces

Internal Acoustic Design Criteria:

- (1) Sound transmission reduction targets, calculated using recognised design guidelines, field or laboratory test results by certified/ accredited agency
- (2) Reverberation time targets demonstrated by detailed design calculations or acoustic modelling
- (3) Sound reinforcement systems and/or public address system (where applicable)

Internal Acoustic Design Proposals

- (1) Proposals for sound absorptive finishes and supporting calculations for typical areas
- (2) Proposals for sound insulation with supporting calculations or field or laboratory test results by certified/accredited agency for typical areas.

Acoustic Verification:

Environmental Noise & Survey (As-Built):

- (1) Methodology and testing standards
- (2) External impact of development on the surroundings

Façade Noise Ingress Control (As-Built)

Façade ingress noise measurement for internal areas

Internal Acoustics (As-Built):

- (1) Sound Insulation measurements
- (2) Reverberation times measurements
- (3) Commissioning and handover of noise masking or sound reinforcement systems (*where applicable*)

Useful references:

AS/ NZS 2107 (2016) 'Acoustics – Recommended design sound levels and reverberation times for building interiors' Standards Australia

BS 8233 (2014) 'Guidance on sound insulation and noise reduction for buildings'; British Standards Institution

ISO 16283-1 (2014) 'Acoustics - Field measurement of sound insulation in buildings and of building elements -- Part 1: Airborne sound insulation'; International Standards Organisation

ISO 3382 Acoustics - Measurement of room acoustic parameters

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