Ministry of Housing,
Communities &
Local Government

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Final Impact Assessment: Ban on combustible materials in external wall systems. Building (Amendment) Regulations 2018 SI 2018/1230

Presented to Parliament by Command of Her Majesty

November 2018

Impact Assessment: Ban on combustible materials in external wall systems

1.1. Summary

1.2. This analysis assesses the impact of a proposed ban on the use of combustible materials in external wall systems and balconies. This will only allow materials that are A2-s1, d0 rated and above under the European classification system set out in the standard BS EN 13501-1 subject to exemptions. The analysis compares the ban against a 'Do nothing' option of no change to the Building Regulations.

1.3. The change should make it easier to comply with the relevant Building Regulations' requirements by making the routes to compliance clearer. The analysis concludes that there will be a one-off transition cost as the industry familiarises itself with the changes of £0.5m. The equivalent annual direct cost to developers and owners is estimated to be £24.9m-£33.7m (central £29.3m)[1].

1.4. Problem under consideration, policy options and objective

1.5. The objective of the policy option is to provide certainty about materials to be used in external wall systems of buildings within scope of the ban. Since the Grenfell fire there has been much debate about compliance and interpretation of provisions in the Building Regulations' guidance relating to the requirement for external walls on buildings to adequately resist the spread of fire. Concerns have been raised about the robustness of the BS8414 test which can be used as a method of demonstrating compliance with this requirement. Dame Judith Hackitt's independent report into building regulations and fire safety[2] indicated that when choosing between products that are non combustible or of limited combustibility and products undergoing full-scale system tests, the lower risk option is to use products that are non combustible or of limited combustibility.

1.6. Following the consultation, the government has announced that the ban on combustible materials will apply to buildings with a storey over 18 metres high which contain a flat. Student accommodation, registered care premises, hospitals and dormitories in boarding schools all over 18m will also be covered by the ban. The ban will apply to new buildings or when there are

[1] See annex for methodology

[2] https://www.gov.uk/government/collections/independent-review-of-building-regulations-and-fire-safety-hackitt-review

material changes of use or material alterations to the building, as defined in the Building Regulations. All elements of the external wall will be covered by the ban; including specified attachments such as balconies, solar panels and sun shadings, with exemptions for certain components (see below).

Option One – Do nothing

1.7. Under this option there would be no change to Building Regulations and there would be no prescriptive ban on the use of combustible materials in external wall systems. For this option, the undertaking of BS8414 tests and assessments in lieu of tests would still be a permitted route to demonstrate compliance of a cladding system with the Regulations.

Option Two – Ban combustible material in external wall systems of the buildings in scope. Preferred option.

1.8. In this option, changes would be made to Building Regulations which would ban the use of combustible materials in external wall systems and balconies. This analysis assumes that blocks of flats, student accommodation, registered care premises, hospitals and dormitories in boarding schools (all over 18m) are in scope for the ban. This option would require that materials in external wall systems and balconies have a minimum performance of class A2-s1, d0 or A1 under the relevant European classification system set out in BS EN 13501-1. This analysis assumes that some key materials which are unable to meet the requirement are exempted. A full table of exemptions is included in the Annex.

1.9. Costs and Benefits of each option

1.10. MHCLG has worked with consultants[3] to estimate the costs to developers or building owners of both options.

1.11. Costs Option One: Do Nothing

1.12. The costs of option 1 reflect the total cost of the construction industry continuing to use a mixture of A1, A2-s1, d0 and non-A classified materials in construction projects relating to cladding and balconies. Over 10 years, the present value of discounted costs is estimated to total £10.3bn-£14.3bn.

[3] Adroit Economics Consortium

These costs are discounted at the Green Book discount rate of 3.5% over 10 years. In this option a proportion (15%-30%) of projects[4] are estimated to use non-A rated materials. There is also a significant proportion of projects estimated to voluntarily use A2-s1, d0 rated materials and above (70%-85%)[5]. In the do nothing scenario, balconies will continue to use timber decking and joists, which are non-A classified materials. 90% of galvanised steel balconies use non-A classified materials, while for concrete balconies this number is 40%. 55%-60% of residential buildings have balconies.

1.13. Costs Option Two: A2-s1, d0 classified and above

1.14. The most significant costs of this option are for the cladding and balcony costs for residential buildings over 18m, with office to residential conversions being the second biggest contributor. We estimate that each year around 600-950[6] residential buildings over 18m are affected by this option, as well as around 75 office to residential conversions (over 18m).

1.15. The analysis assumes that a proportion of building projects already being carried out in the counterfactual is meeting A2-s1, d0 or even A1 fire classes. In this option, there would be no non-A rated systems installed, owing to the ban. It is assumed that the same proportion of projects would use A1 rated systems (20%-35%) as in the counterfactual. This is for reasons other than this specific policy (e.g. insurance requirements). A higher proportion would use A2-s1, d0 rated systems under this preferred option (65%-80%) compared to the counterfactual (35%-50%). See table 1 below:

Proportion of A1, A2-s1, d0 and Non-A rated depending on option

	Option 1	Option 2
A1	20%-35%	20%-35%
A2-s1, d0	35%-50%	65%-80%
Non-A rated	15%-30%	0%

Table 1. Adroit Economics Consortium.

1.16. There are significant differences in the costs per building for refurbishment/retrofit for A2-s1, d0 or above compared to the counterfactual[7].

1.17. The difference in the costs per building of A2-s1, d0 rated systems compared to non-A rated (counterfactual) differs depending on whether it is new build or

[4] Projects are defined as new build, retrofit of cladding and refurbishments of cladding.
[5] Based on estimates provided by the Adroit Economics Consortium.
[6] The range comes from doing sensitivity analysis, where different growth rates for building stock and projects are used in a high and low scenario.
[7] We used three reference buildings to obtain detailed cost estimates for these different systems. The costs are based on 3 reference buildings of 8 storeys (Low), 15 storeys (Medium) and 21 storeys (High).

refurbishment/retrofit. This reflects costs to developers/owners and includes on-costs[8].

Cost per building (non-A into A2-s1,d0) option 2 compared to counterfactual

	Low building	Mid building	High building
New build – Brick	£ 39,359	£ 102,308	£ 150,453
New build – cladding system	£ 30,247	£ 78,623	£ 115,622
Refurbishment – cladding system	£ 70,205	£ 74,150	£ 103,996

Table 2. Adroit

1.18. In terms of balconies, the impact per building will depend on the types of balcony installed and the number per building. There are three types of balcony that have been included; recessed galvanised steel (40%), projected galvanised steel (40%) and recessed concrete (20%).

Proportion of balcony types depending on option

	Option 1	Option 2
Recessed Galvanised steel	40%	25%
Projected Galvanised steel	40%	40%
Recessed Concrete	20%	35%

Table 3.

1.19. The additional cost per balcony ranges from £250-£750, as timber decking and joists are replaced. The annex sets out a full break down of costs per balcony by building type. This means the cost of mandating that newly built balconies have A2-s1, d0 or above materials will have an equivalent annual cost to developers of £7.5m-£10.3m, compared to the counterfactual.

1.20. When there is a material change of use to a building into one of the building types in scope, the building will have to meet the new minimum requirement for materials to be rated A2-s1, d0 or A1. This will impact, for example, on office to residential conversions.

1.21. We have worked with consultants to estimate the impact of this. For this modelling purpose only an indicative estimate is assumed of circa 75[9] buildings per annum over 18m being converted each year, of which 60% have brick facades and 40% have rainscreen facades. It is also assumed that 30% of these existing facades are already A rated.

1.22. In the counterfactual, it is assumed that 85% of these facades would be refurbished to improve thermal performance, of which, given insurance and other pressures post-Grenfell, it is assumed that 70% of these facades would be refurbished with A rated materials in the absence of this policy.

[8] On-costs include design and development contingencies, contractor preliminaries, professional fees and contractor profits and overheads.

[9] Based on government net additional dwellings statistics.
https://www.gov.uk/government/collections/net-supply-of-housing

1.23. For policy option two, it is assumed that there is no change to the proportion of new facades that are installed to improve the thermal performance of the building. However, all new facades would now be A rated. The extra cost for these thermal refurbished buildings is estimated at around £91,000 per building for brick and £81,000 per building for ACM facades.

1.24. Under option two, a small number of buildings that could achieve the improved thermal performance without refurbishing the façade would be required to replace non A-rated cladding with A-rated at a cost of £1.6m per building.

1.25. The equivalent annual extra over cost to owners for these buildings of option 2 over option 1 is estimated at £5.9m. The equivalent annual cost to society is £4.1m.

1.26. Any office buildings with brick facades over 18m containing non A-rated insulation behind the façade and being converted to residential use will also be included in the ban. Many brick-facade offices over 18m are likely to have been built before the regulations required insulation in walls and more recently will have been built with A-rated insulation or will have non A-rated insulation between two masonry skins. After discussions with the consultants we have concluded that brick buildings over 18m with non-A rated insulation with lightweight internal skins are likely to be rare. We have not monetised this impact.

1.27. For the preferred option as a whole, over 10 years, the present value of discounted costs is estimated to total £10.5bn-£14.6bn. These costs are also discounted at the Green Book discount rate of 3.5% over 10 years. The total transition costs are estimated to be £0.5m, reflecting the time taken by members of industry to understand the change in policy. The equivalent annual direct cost to developers and owners of option two over option one is £24.9m-£33.7m (central £29.3m).

1.28. For option 2 the total cost to society is £8.0bn-£11.3bn (central £9.6bn), and the social equivalent annual cost is £18.5m-£25.3m (central £21.9m). These social costs do not include transfer payments, such as VAT.

Summary Cost Table

Present value costs (10 years)			
	Option 1	Option 2	Net cost
Transition costs	-	£0.5m	
Total costs	£10.3bn-£14.3bn (central £12.3bn)	£10.5bn-£14.6bn (central £12.5bn)	
Equivalent annual cost			
Annual cost	£1.2bn-£1.7bn (£1.4bn)	£1.2bn-£1.7bn (central £1.5bn)	£24.9m-£33.7m (central £29.3m)

Table 4. Source: Adroit Economics Consortium

Non-Monetised Impacts

1.29. Some of the consultation responses raised the issue of unintended consequences of the ban, in particular a potential loss of space. The reason for this is that A1 rated materials like mineral wool insulation are likely to be bulkier. We have worked with consultants to analyse the potential impact of this, which we have concluded it is minor for the majority of cases. The annex provides further details.

Benefits

1.30. The main benefits that derive from option 2 relative to the counterfactual are that it will make routes to compliance clearer. The Government's building safety programme has identified high rise residential buildings which have been discovered to have combustible aluminium composite material cladding panels which did not follow the provisions of Building Regulations guidance. The purpose of the ban is to make clear exactly what materials can and cannot be used. This will make compliance easier to identify for designers, installers and building control bodies.

1.31. Better compliance will ensure that fire safety risks are better identified and managed by developers, so reducing risks. We have not monetised these benefits.

1.32. Another consequence of the ban will be to rule out the opportunity to use assessments in lieu of tests for external wall systems which may have led to inappropriate approaches to the design and installation of external wall systems incorporating combustible cladding. A clear ban will rule this out.

1.33. By explicitly banning most non-A materials there will be greater clarity about what is permitted to be used on site and in the construction process. This clarity makes it harder for the incorrect materials to be procured and then used in the construction process without being noticed, reducing unintentional non-compliance.

1.34. There are minor cost savings for the design stage of building construction. This is because less time is spent on considering and deciding between the different types of materials and external wall systems, now that there are fewer options to choose from. The costs of undertaking whole system wall tests (BS 8414 tests) will also be avoided.

1.35. Risks and Assumptions

1.36. The costs of the policy options are estimated using a number of assumptions. The key areas where assumptions are made are:

- Forecast stock and rate of new build of blocks of flats, student accommodation, registered care premises, hospitals and dormitories in boarding schools over 18m.

- Number and type of external cladding/insulation projects that are installed each year.
- The proportion of buildings and flats that have balconies installed.
- The proportion of projects and balconies that already meeting A1 rating and above and A2-s1, d0 rating and above.
- Differences in the costs per building for refurbishment/retrofit and new build for A1, A2-s1, d0 and non-A rated systems.

1.37. The costs of particular materials such as brick and ACM facades are based on detailed cost estimates produced by the Adroit Economics consortium. These are obtained from a sample of quotes from industry. See annex for further details.

1.38. We do not expect the ban to have a significant impact on housing supply. As indicated above, a significant proportion of new projects are already using materials which would meet the new requirements. For those which are affected, the extra costs incurred will be small in proportion to the total build cost. See annex for per building costs.

1.39. As indicated above, there is a risk that additional space required will add cost. However, after discussions with the Adroit Economics Consortium, we have concluded that outward adjustments to the external wall can be made in most instances. Significant costs are only likely to occur where space constrained buildings already have planning permission or have started on site. Overall, the costs due to space considerations are likely to be modest. More detailed consideration of potential space issues can be found in the annex.

1.40. The Price Base Year and the Present Value Base Year are 2018 and the discount rate of 3.5% is in line with Green Book guidance.

1.41. There is a degree of uncertainty about the estimates and the assumptions. Sensitivity analysis and production of high and low estimates has been carried out to reflect this uncertainty.

Annex

i. Cost methodology
   a. The equivalent annual cost is calculated by finding the cost difference between option 1 and option 2.
   b. The cost of each option is calculated by using the number of building projects with cladding in a year, and multiplying that by the cost of materials for that type of project. The number of projects is a function of the rate of new build and the retrofit/refurbishment rate of the current stock. The cost of materials depends on the size of the building and type of façade. Costs will also depend on whether the building is using spandrel panels or has balconies.

ii. Evidence base
   a. The material difference between using A2-s1, d0 and non-A rated materials was calculated by commissioning certified architects to design a standard external wall with these materials, and then comparing the costs between these different combinations.
   b. Reference buildings were developed with consultants and used as the basis to estimate the impact on the wider building stock. These buildings, along with knowledge on how the building stock has changed over time, were used to inform the proportion of buildings with A1, A2-s1,d0 and non-A rated materials.

iii. Exemptions
   a. Some materials should be exempted from the regulation. A detail list of exemptions is compiled below.

Product	**Definition**
Membranes	Membranes is a common term used in the industry and does not need any specific definition
Roofing materials	Components of a roof that extends to the junction of the external wall
Internal decorative wall finish	Internal wall finish - inner most surfaces directly exposed to the interior of the building on the external wall
Windows	Windows made out of glass and transparent and associated window frame including glazing, features, fixings and ironmongery
Doors	Doors and door sets located on the external wall including associated frames and ironmongery.
Thermal breaks,	Thermal breaks where they are necessary to prevent thermal bridging and meet the requirements of Schedule 1 Paragraph L.
Cavity trays	Cavity trays as part of a masonry wall systems including two leaves of masonry construction
Seal, fixings, gaskets, sealants and backer rod.	Seal, fixings, gaskets, sealants and backer rod
Electrical installations	All electrical installations as defined in the Building Regulation already.

Product	Definition
Fire stopping and Intumescent Materials	Fire stopping and intumescent materials where they are necessary to meet the requirements of paragraph B of Schedule 1
Insulation used under ground location	Insulation used where it is located underground.

iv. Small Business

a. We have considered the impact on small businesses and concluded that the costs will not disproportionately affect businesses with a low turnover.

v. A2-s1, d0 external wall system cost breakdown

a. Using consultants and empirical data we have estimated the cost of the attributes of the three reference buildings and their make-up, including ACM coverage, European fire rating type and external wall system materials. The costs reflect different architectural design methods, and take into account spandrel panels where appropriate. The costs will differ depending on the façade (brick or ACM) and the type of building project (new build or retrofit/refurbishment). See table below for the cost per building of using A2-s1, d0 instead of non-A rated materials:

	low building	mid building	high building
New build – Brick	£ 39,359	£ 102,308	£ 150,453
New build - Cladding system	£ 30,247	£ 78,623	£ 115,622
Refurbishment - Cladding system	£ 70,205	£ 74,150	£ 103,996

Table 5. Source: Adroit Economics Consortium

vi. Balconies

a. Balconies will be affected by this policy. New build residential projects with balconies will no longer use non-A rated materials, resulting in more expensive decking and joists in some buildings. Because not all flats in a building have balconies, the cost per building will depend on the size of that building. See below for the cost difference of having A2-s1, d0 or A1 rated materials in balconies compared to the counterfactual, including on-costs. Recessed Galvanised steel is the most expensive type.

Additional cost per building of balconies being A2-s1, d0 compared to the counterfactual

Low Building	**low cost**	**mid cost**	**high costs**
Recessed Galvanised Steel	£ 51,810	£ 71,619	£ 91,429
Projected Galvanised Steel	£ 48,762	£ 70,095	£ 91,429
Recessed Concrete	£ 30,476	£ 30,476	£ 30,476

Table 6

Medium building	low cost	mid cost	high costs
Recessed Galvanised Steel	£ 71,638	£ 99,029	£ 126,420
Projected Galvanised Steel	£ 67,424	£ 96,922	£ 126,420
Recessed Concrete	£ 42,140	£ 42,140	£ 42,140

Table 7

Tall Building	low cost	mid cost	high costs
Recessed Galvanised Steel	£ 104,168	£ 143,996	£ 183,825
Projected Galvanised Steel	£ 98,040	£ 140,933	£ 183,825
Recessed Concrete	£ 61,275	£ 61,275	£ 61,275

Table 8

vii. Timber building

a. The policy prohibits the use of timber materials in the external wall of buildings within the scope. Currently the number of projects above 18m in height where load bearing structural timber elements are used remains relatively small. The effect of the ban on the use of engineered timber remains limited in the short term. There is however a growing number of buildings above 18m in height using engineered timber as part of their structure. Engineered timber offers an alternative to traditional methods of construction in buildings within the scope of the policy. It is therefore likely to slow down the use of engineered timber in future development in the medium to long term.

viii. Impact on space requirements

a. As walls get thicker, ties, brackets, fixings, flashings and structural supports all get deeper which adds costs. This adds weight, along with the thicker insulation, which may impact in the foundation depth and size. However, these costs are estimated to be modest, and therefore it was considered not proportionate to monetise these.

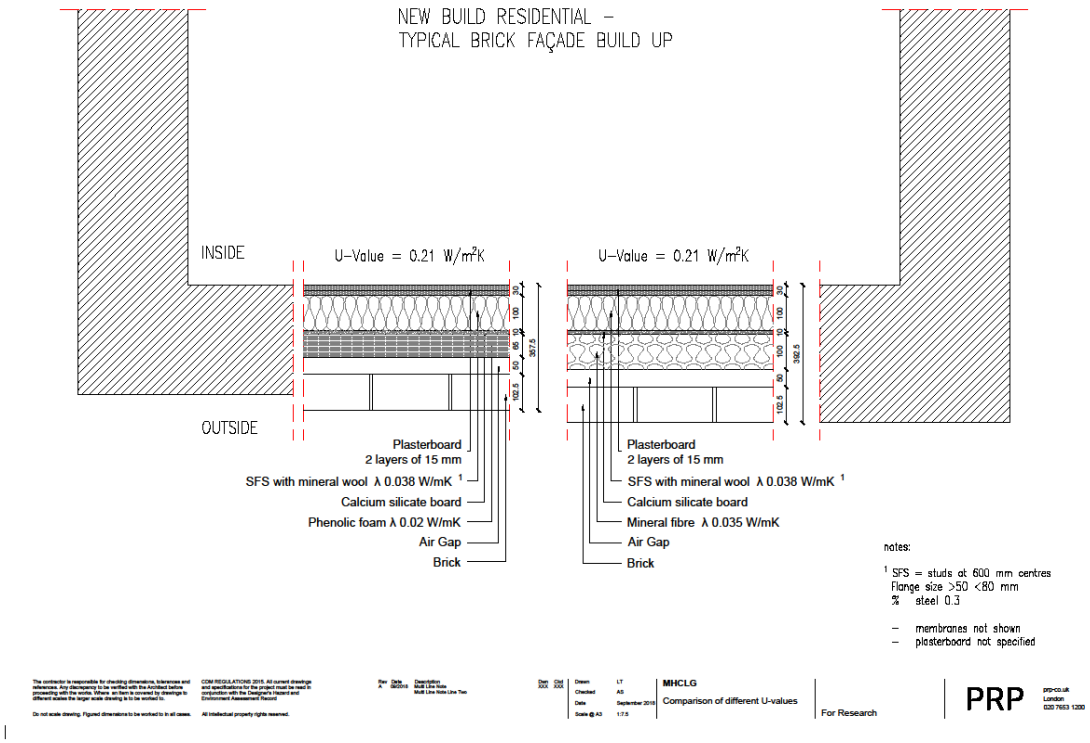
b. To understand the potential impact of bulkier materials as a consequence of higher fire performance ratings, two drawings of a wall build up for brick and rainscreen ACM facades have been produced to show the impact on wall thickness of changing phenolic insulation to mineral fibre. These drawings can be found below. For both of these, the U value is typical for a new build residential building. If a building is being designed, then any extra wall thickness will result in the wall growing outwards into the external space. The drawings in the annex and Table 9 below show that the impact is minimal.

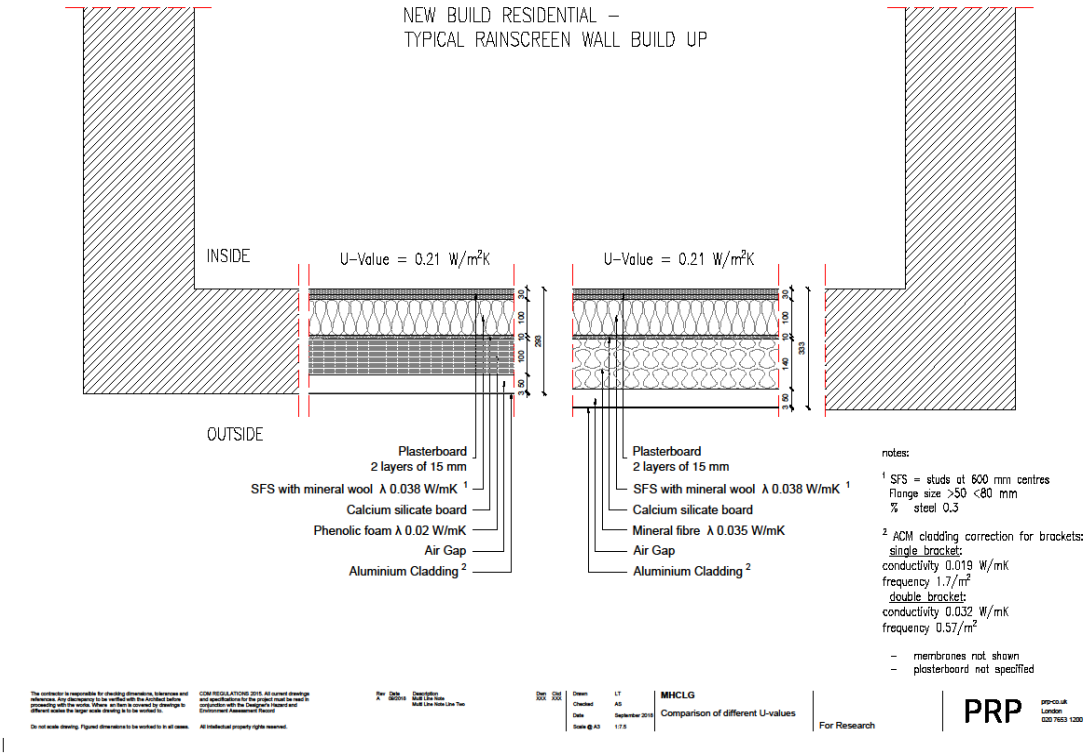
Impact of Mineral fibre on wall thickness

	Phenolic foam	Mineral Fibre	Differences
New build – Brick façade	357.5mm	392.5mm	35mm
New build – Rainscreen ACM façade	293mm	333mm	40mm

Table 9

c. Table 9 above indicates that for a new build brick façade, an additional 35mm of space would be needed whereas for a rainscreen ACM façade an additional 40mm would be needed from using Mineral fibre insulation rather than phenolic foam. We have concluded that only where a site is very constrained would the impact potentially affect the internal space, and these cases are expected to be rare.




NEW BUILD RESIDENTIAL –
TYPICAL RAINSCREEN WALL BUILD UP
INSIDE
OUTSIDE
U-Value = 0.21 W/m²K
U-Value = 0.21 W/m²K
Plasterboard
2 layers of 15 mm
SFS with mineral wool λ 0.038 W/mK 1
Calcium silicate board
Phenolic foam λ 0.02 W/mK
Air Gap
Aluminium Cladding 2
Plasterboard
2 layers of 15 mm
SFS with mineral wool λ 0.038 W/mK 1
Calcium silicate board
Mineral fibre λ 0.035 W/mK
Air Gap
Aluminium Cladding 2
notes:
1 SFS = studs at 600 mm centres
Flange size >50 <80 mm
% steel 0.3
2 ACM cladding correction for brackets:
single bracket:
conductivity 0.019 W/mK
frequency 1.7/m²
double bracket:
conductivity 0.032 W/mK
frequency 0.57/m²
– membranes not shown
– plasterboard not specified
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Comparison of different U-values
For Research
PRP