Dampness in granite buildings in Aberdeen

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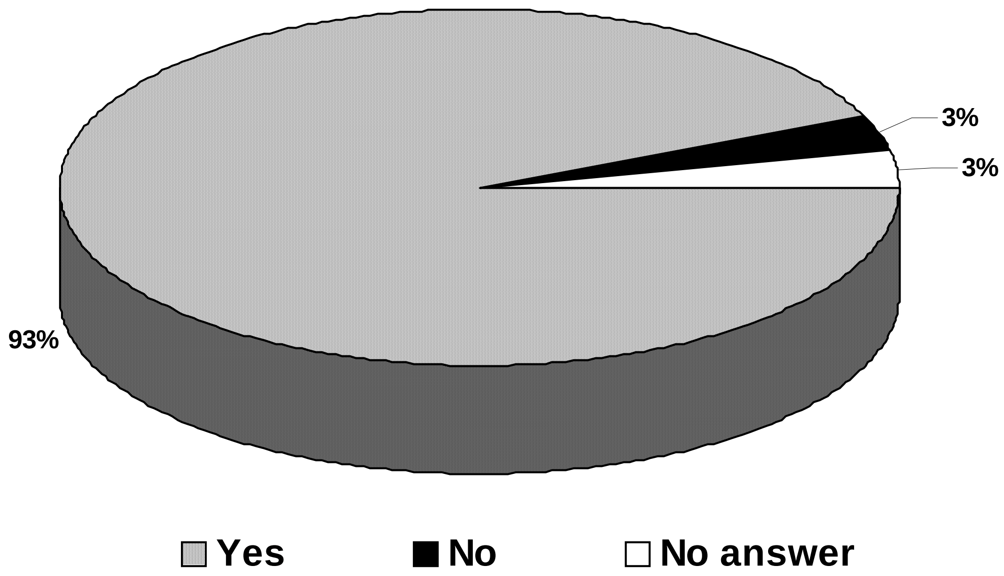
1 Questionnaire study

A total of 202 questionnaires (Appendix 1) were sent out to architects, building surveyors, building consultants, chartered surveyors and individuals and companies involved in architectural services and damp control. All were located in the Aberdeen City & Aberdeenshire area, concentrating mainly in regions where granite is a commonly used building material. Areas included Aberdeen City, Aboyne, Alford, Ballater, Banchory, Elgin, Ellon, Fraserburgh, Huntly, Inverurie, Peterhead and Westhill. There was a good rate of reply with 60 questionnaires returned (30% of those sent out).

Analysis of respondents' opinions is presented below. Generally this is from analysis of the whole data set, however, in some cases it has been useful to compare the responses of less experienced with more experienced practitioners. Less experienced practitioners are referred to as 'non-expert', and this group consists of those respondents who reported having experience of fewer than 10 properties in the last 5 years. More experienced practitioners are referred to as 'expert', this group having reported working on more than 10 properties in the previous 5 years. This subdivision is based on the level of experience reported by respondents in answer to question 2 - "*How many properties with damp problems have you been involved with in the previous five years?*"

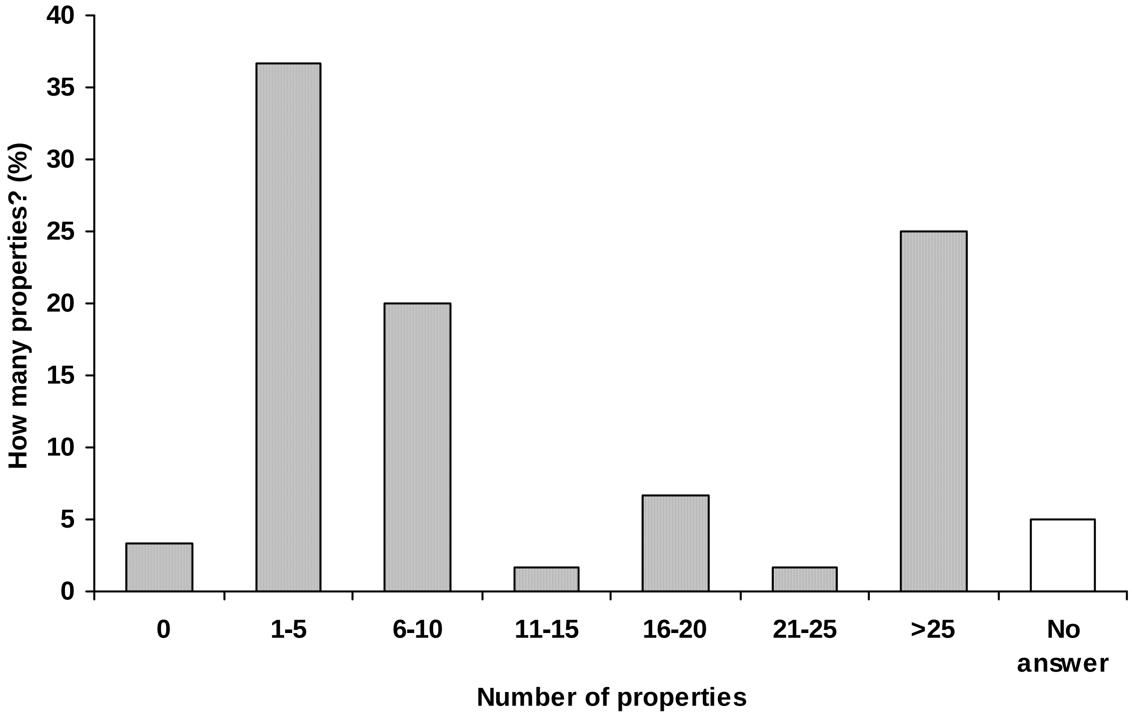
When asked if they are of have been "*...involved in assessing or treating damp problems in buildings?*", 93% of respondents answered that they are actively involved in assessing and/or treating damp problems (Figure 1.1). Two respondents were not directly involved and two did not reply to this question.

Figure 1.1 Answers to the question "Are you, or have you been, involved in assessing or treating damp problems in buildings?"



As stated above, to determine their level of experience, respondents were asked "*How many properties with damp problems have you been involved with in the previous five years?"* Level of experience (Figure 1.2) has been used in some data analysis below to determine whether this affected practitioners' opinions. Practitioners who reported dealing with more than 10 properties in the last five years have been considered to have a relatively high level of experience; they are referred to below as 'experts'. 21 respondents indicated that they had this level of experience. Other respondents are considered to have a relatively low level of experience. 36 respondents come into this category; they are referred to below as 'non-experts'. Three respondents did not indicate their level of experience.

Figure 1.2 Answers to the question "How many properties with damp problems have you been involved with in the previous five years?"

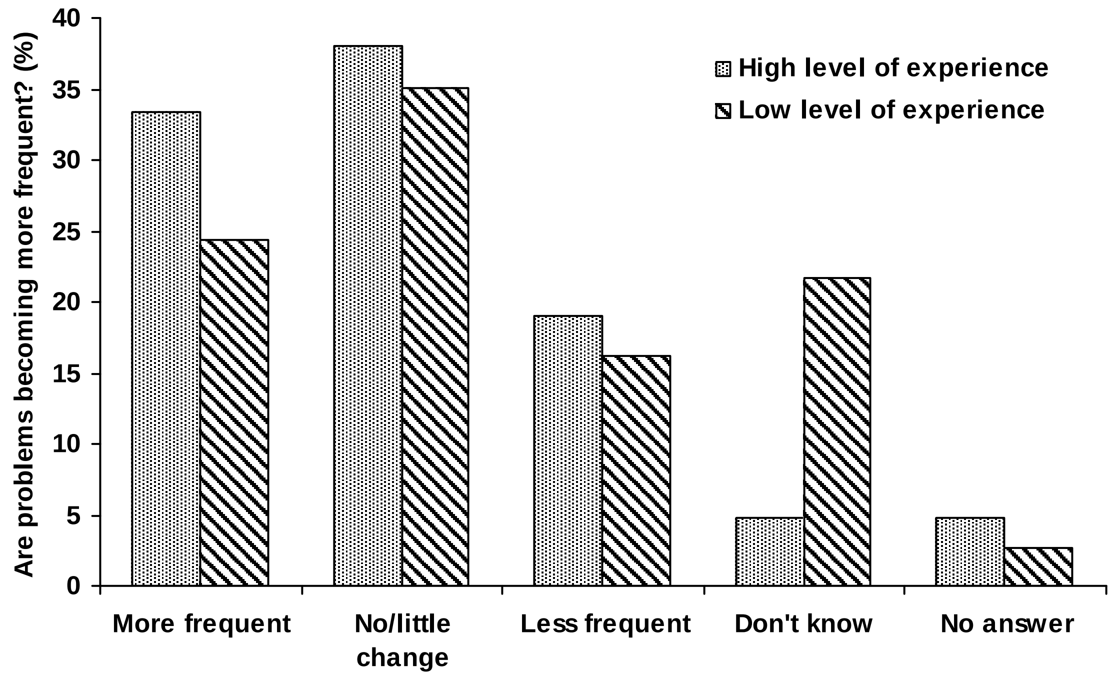


Respondents were asked for their opinion on whether damp problems were becoming more or less frequent ("*Do you think that damp problems in housing have become more or less frequent in recent years?*"). The most common response (Table 1.1 & Figure 1.3) was that there was little change in the frequency of problems, although substantial numbers of respondents opted for a greater frequency or a lesser frequency of problems. There was no clear difference in response depending on level of experience although rather more respondents with a low level of experience said that they did not know whether there had been any change in the frequency of damp problems.

Table 1.1 Comparison of 'expert' and 'non-expert' answers to the question "Do you think that damp problems in housing have become more or less frequent in recent years?" Data show percentages of respondents agreeing with each statement.

	Respondent type		
Statement	**All**	**'Expert'**	**'Non-expert'**
No/little change	35	38	36
More frequent	25	33	22
Less frequent	17	19	17
Don't know	15	5	22
No answer	8	5	3

Figure 1.3 Answers to the question "Do you think that damp problems in housing have become more or less frequent in recent years?"



Respondents were asked, "*In what percentage of damp affected properties would you estimate that problems are due to the following?*" The options given were:

- condensation,
- moisture penetration,
- both condensation and moisture penetration,
- unknown cause.

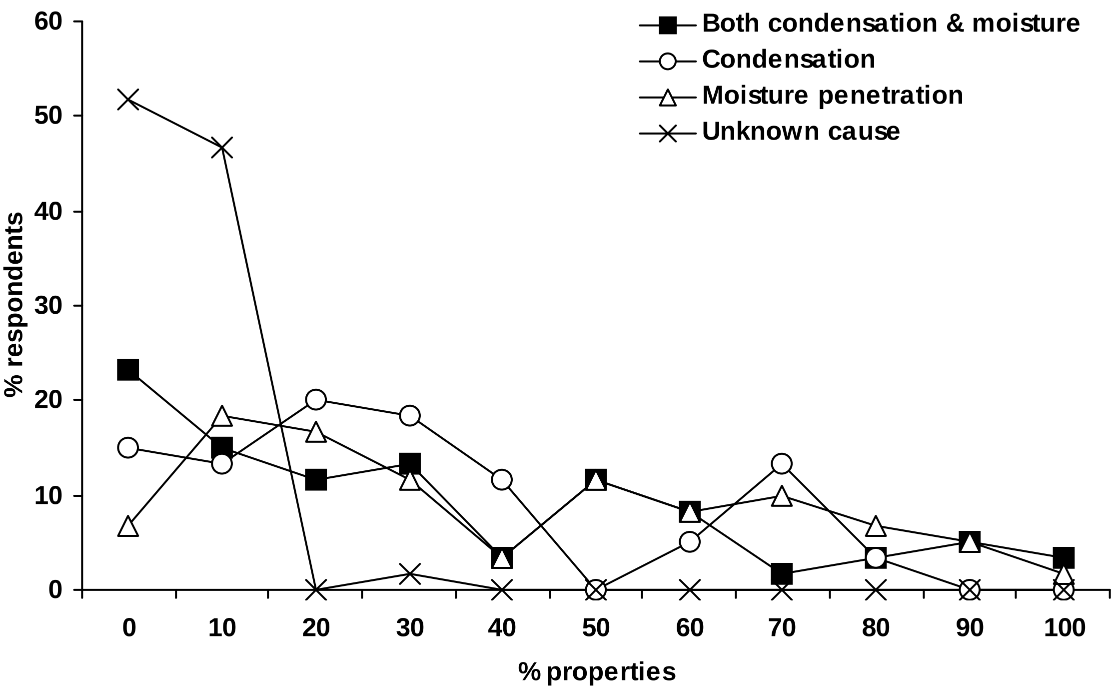
Respondents' answers to this question varied widely, providing no overall consensus (Figure 1.4). The variability of response is probably due to the difficulty of estimating the proportions of the factors involved in dampness and to the different experiences and opinions of respondents with respect to causes of damp problems. If we consider only the more experienced ('expert') practitioners, then, on average about 6% of properties were attributed to unknown causes of dampness, 35% to moisture penetration, 29% to condensation and 30% to a combination of moisture penetration and condensation (Table 1.2). We can compare the results from the questionnaire survey with those from the Scottish House Condition Survey (1996)[1]. A further survey is scheduled to take place during 2002. The relative proportions of condensation and penetrating damp problems are shown in Table 1.2. These data suggest that, of problems that come to the notice of building professionals, local experience is of relatively more damp penetration problems than the national average.

Table 1.2 Comparison of data from the Scottish House Condition Survey (1996) and estimates, by respondents to this questionnaire, of proportions of properties affected by damp problems.

Cause	% of damp affected properties under each cause		
	Scottish House Condition Survey (1996)	**Estimate from this survey ('expert')**	**Estimate from this survey ('non-expert')**
Condensation	66	29	28
Penetrating damp	16	35	37
Both	17	30	30
Unknown cause	1	6	6

[1] *http://www.shcs.gov.uk/*

Figure 1.4 Answers to the question "In what % of damp affected properties would you estimate that problems are due to the following? - Condensation/ Moisture penetration/ Both/ Unknown causes"

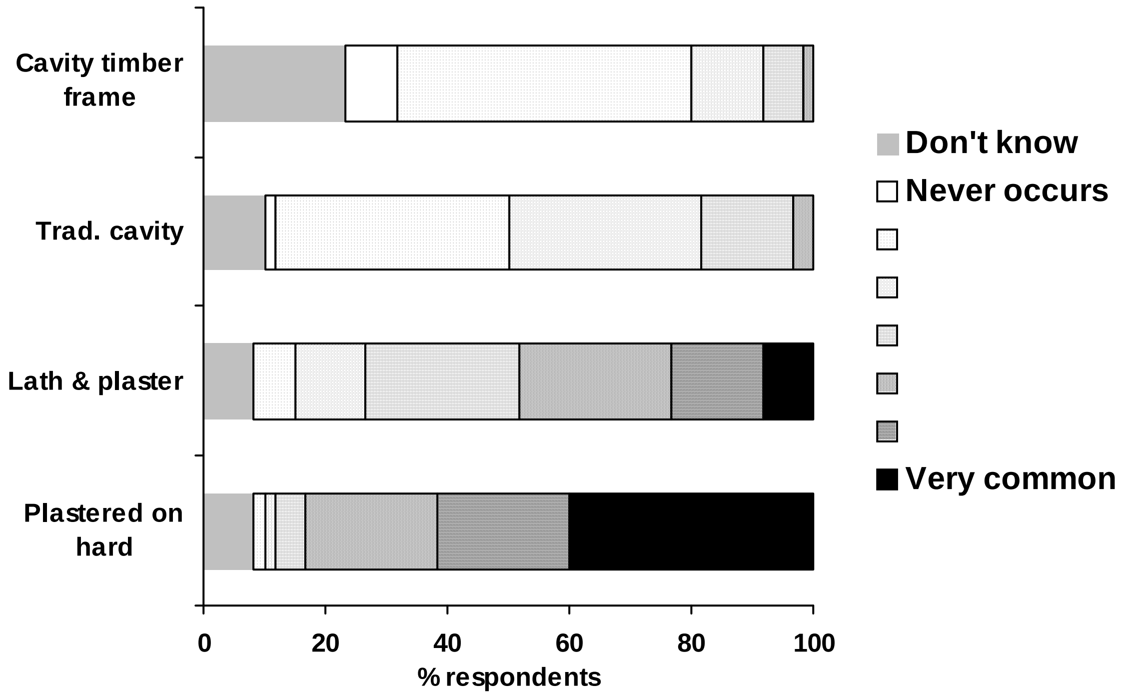


Respondents were asked for their opinion on whether *"... buildings of a particular type [were] more susceptible to damp problems?"* The results (Figure 1.5) show very clearly that practitioners are aware of many more damp problems with some types of building construction. Solid masonry walls plastered on the hard were felt to be most susceptible to problems. Problems were also fairly common on solid masonry walls with lath & plaster. Substantially fewer damp problems were experienced with traditional cavity walls and cavity timber frame with external cladding. 'Expert' opinion was slightly more strongly supportive of these findings than 'non-expert' opinion (Table 1.3).

*Table 1.3 Comparison of 'experts' and 'non-experts' with respect to the question "Are buildings of a particular type more susceptible to damp problems?" Data show 'expert' percentages in **bold** and 'non-expert' percentages in brackets, excluding don't knows.*

	Solid masonry wall plastered on the hard (%)		Solid masonry wall with lath & plaster (%)		Traditional cavity wall (%)		Cavity timber frame with external cladding (%)	
Never occurs	**0**	(0)	**0**	(0)	**5**	(0)	**17**	(7)
...	**0**	(3)	**5**	(9)	**48**	(39)	**67**	(61)
...	**5**	(0)	**14**	(12)	**33**	(36)	**17**	(14)
to	**0**	(9)	**29**	(26)	**10**	(21)	**0**	(14)
...	**20**	(26)	**19**	(32)	**5**	(3)	**0**	(4)
...	**15**	(29)	**10**	(21)	**0**	(0)	**0**	(0)
Very common	**60**	(34)	**24**	(0)	**0**	(0)	**0**	(0)
	'expert'	('non-expert')						

Figure 1.5 Answers to the question "Are buildings of a particular type more susceptible to damp problems?" Categories in full were: 'Solid masonry wall plastered on the hard', 'solid masonry wall with lath & plaster', 'traditional cavity wall' and 'cavity timber frame with external cladding'.

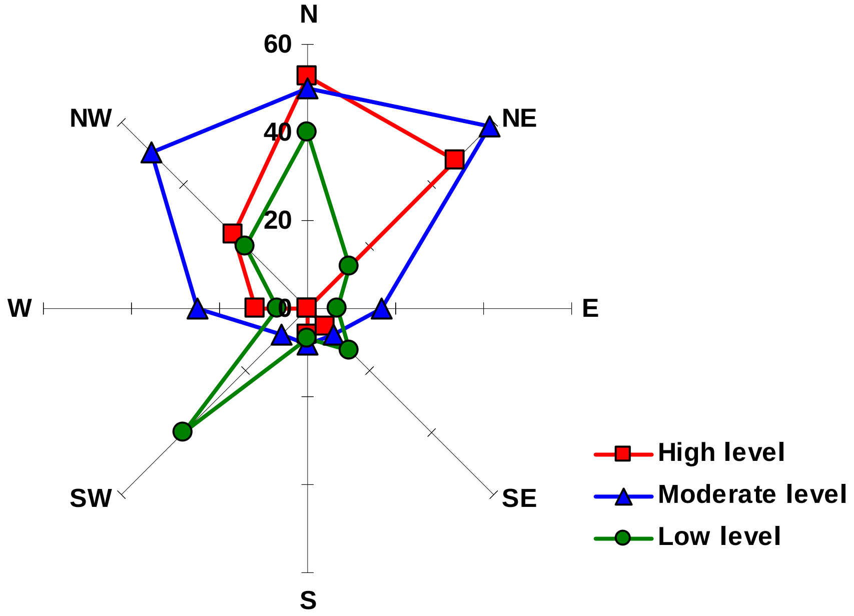


Question 6 asked practitioners whether *"damp problems [were] more frequent on external walls with a particular facing direction?"* 74%of respondents said "Yes". Those who answered "Yes" were asked *"which facing direction/s are most commonly associated with damp?"* Practitioners mainly felt that northerly facing walls, especially north and north-east facing walls, were most commonly associated with damp (Figure 1.6). This opinion was more strongly held by more experienced practitioners (Table 1.4). Vulnerability of south-westerly facing walls to damp was noted by many less experienced practitioners and was commonly said to be due to "prevailing winds". More experienced practitioners also noted "prevailing winds", but from a northerly or north-easterly rather than a south-westerly direction. Some more experienced practitioners also cited "orientation to the sun" and consequently lower surface temperatures as being responsible for "reduced levels of drying by evaporation".

Table 1.4 Facing directions most commonly associated with damp, subdivided by level of expertise of respondents. Data show percentage respondents replying "Yes" with respect to each direction.

Level of experience	**No. properties inspected in previous 5 years**	**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**
Low	**< 6 properties**	40	13	7	13	7	40	7	20
Moderate	**6-15 properties**	42	58	17	8	8	8	17	42
High	**>15 properties**	53	47	0	6	6	0	12	24

Figure 1.6 Answers to the question "which facing direction/s are most commonly associated with damp?", sub-divided by respondents' level of experience. Data show percentage responses.



Practitioners were asked how common they felt particular factors were in relation to dampness problems caused by moisture penetration and condensation (Figures 1.7 & 1.8). Responses for each factor ranged over a seven-point scale from "*never occurs*" to "*very common*". In the Figures, the factors felt to be most commonly associated with damp are shown toward the top of the graphs.

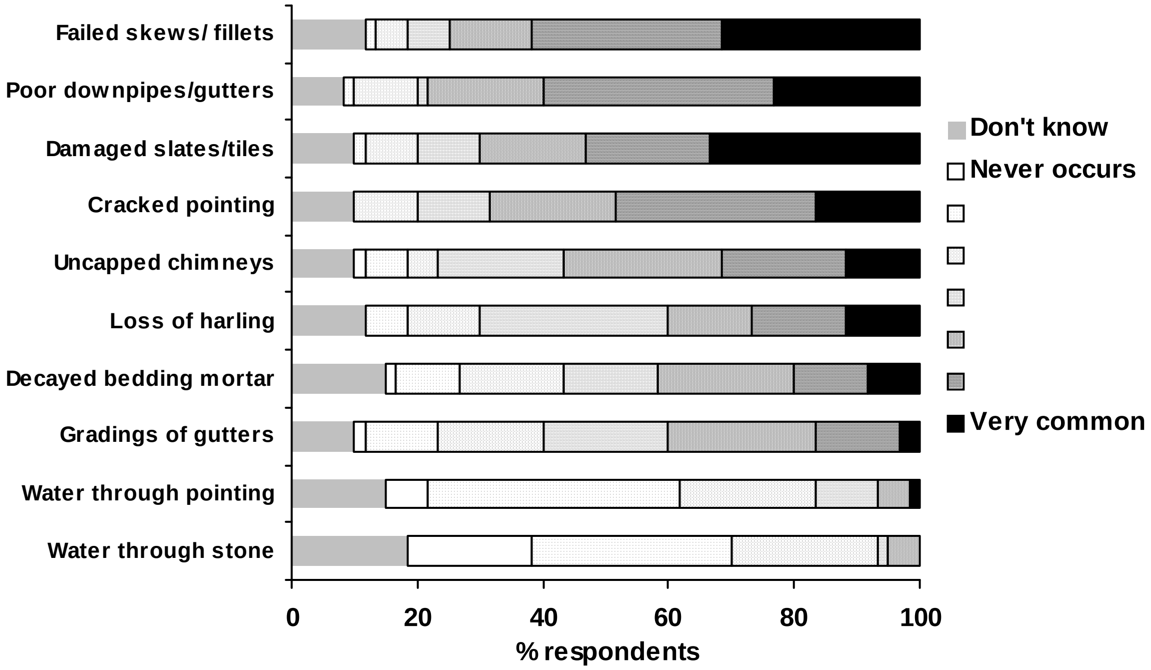
With respect to **moisture penetration**, the most commonly encountered causes were failures at roof level or of water shedding details, such as downpipes, gutters, skews, tilted fillets and slates. Improper grading of gutters was occasionally encountered as a contributory problem. In relation to pointing and mortar, cracked pointing was considered to be a common cause of moisture penetration, decayed bedding mortar less so, but cited as a contributory cause in some instances. Penetration of rainwater through intact mortar was not felt to be an important cause of dampness. Rainwater falling down un-used, uncapped chimneys was noted as a relatively common problem. On the building façade, loss of harling was thought to be a quite frequent cause of dampness although clearly this only applies to buildings which were originally harled. Water penetration through stone was seldom encountered. There was relatively little difference in 'expert' and 'non-expert' opinion. The only statistically significant difference between the two groups was with respect to rainwater penetration down uncapped chimneys, which 'experts' felt to be the most significant problem after defects in roofing or water shedding detail.

Other factors related to moisture penetration mentioned by respondents included:

Poor detailing,
Penetration around windows/doors/defective joinery,
Faulty or failed leadwork,
Failed parapet guttering,
Damaged bedding/mortar as a result of hammer drilling and cement pointing,
Pointing which is not full depth,
Through exposed walls with unused chimney flues - honeycomb effect for moisture to penetrate,
Knocking through 'random' gable walls,
High external ground levels,
Maintenance neglect.

Figure 1.7 Answers to the question "To what extent are the following factors responsible for MOISTURE PENETRATION problems in buildings?" Factors are summarised in the graphs. The full descriptions of each factor were as follows:

Failed skews or tilted fillets
Overflows from blocked/damaged downpipes or gutters
Lost or damaged slates/tiles
Cracked or lost external pointing
Rain water penetration down uncapped chimneys
Removal/loss of harling
Moisture penetration due to decay of bedding mortar
Improper grading of runs on gutters
Moisture permeating through undamaged pointing
Moisture permeating through stone



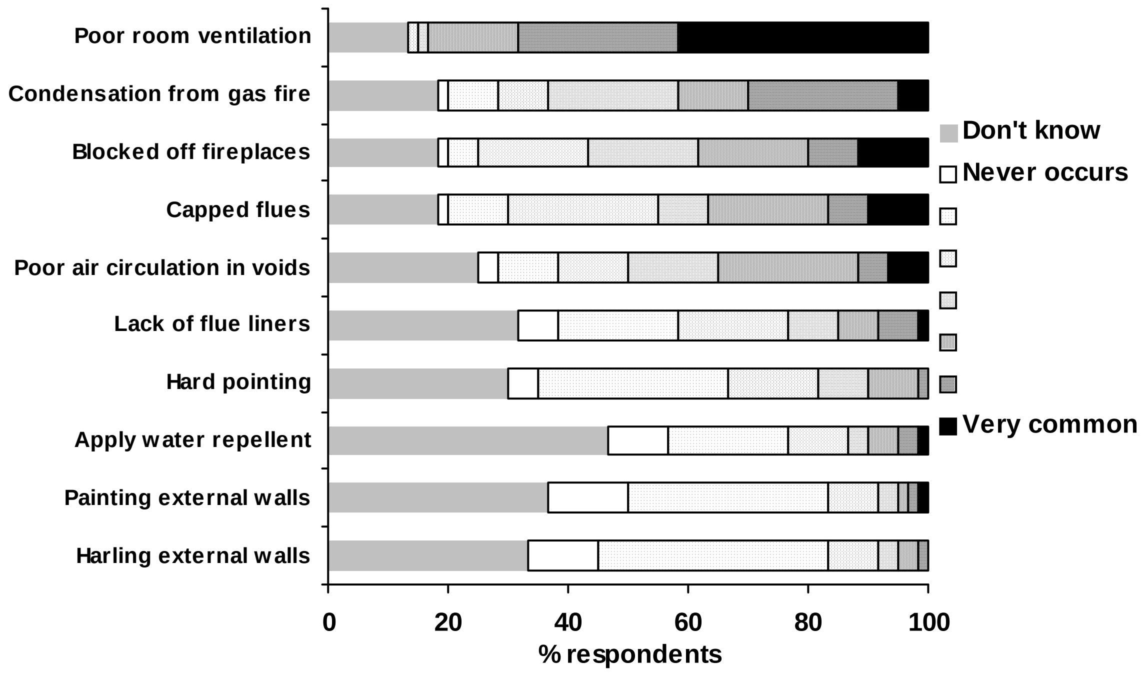
With respect to **condensation**, inadequate ventilation of rooms was clearly felt to be the single most important factor in causing condensation problems, and gas fires were noted as a major source of water vapour. Factors that reduced the rate of ventilation were clearly thought to be important contributory causes to condensation; these included blocking off fireplaces, poor air circulation in voids and capping of disused flues (however, note that uncapped flues were thought to be a common cause of rainwater penetration). Lack of flue liners was occasionally found to cause problems. Factors related to the external skin of the building were not thought to be major contributory causes of dampness through condensation. These included hard, impermeable pointing, application of water repellents, painting or harling of walls.

Other factors related to condensation problems mentioned by respondents included:

Lack of flue liners is a problem in conjunction with the action of ammonium sulphate in chimney breast wall - regular feature,
Unsealed solum,
Cold bridging,
Lack of balance between heating and ventilation,
Unvented tumble driers,
Clothes drying on radiators,
Paraffin/Calor gas heaters,
Inadequate ventilation of loft/roof structure,
Installation of insulation (particularly in roof spaces) without providing suitable ventilation,
Poor air circulation,
Single glazing,
Double glazing without vents,
Overheating.

Figure 1.8 Answers to the question "To what extent are the following factors responsible for CONDENSATION problems in buildings?" Factors are summarised in the graphs. The full descriptions of each factor were as follows:

Inadequate ventilation of rooms
Condensation from gas fire
Inadequate ventilation of blocked off fireplaces
Inadequate ventilation of capped flues
Lack of air circulation in void space or cavity wall
Lack of flue liners
Excessively hard or impermeable pointing
Application of water repellent to external walls
Painting external walls
Harling external walls



To investigate some specific issues, practitioners were asked how often they had found particular factors to be involved in damp problems (Figure 1.9): *"How often have you found the following to be involved in damp problems?"* The factors listed were:

- Lack of damp-proof course
- External soil level higher than damp-proof course
- Occupants blocking air vents
- Bridging debris in wall voids or cavity
- Moisture bridging across wall dooks
- Flue liners not properly installed
- Change in use from open fire to gas fire
- Poorly fitted windows/doors
- Poor façade detailing to control rainwater run-off

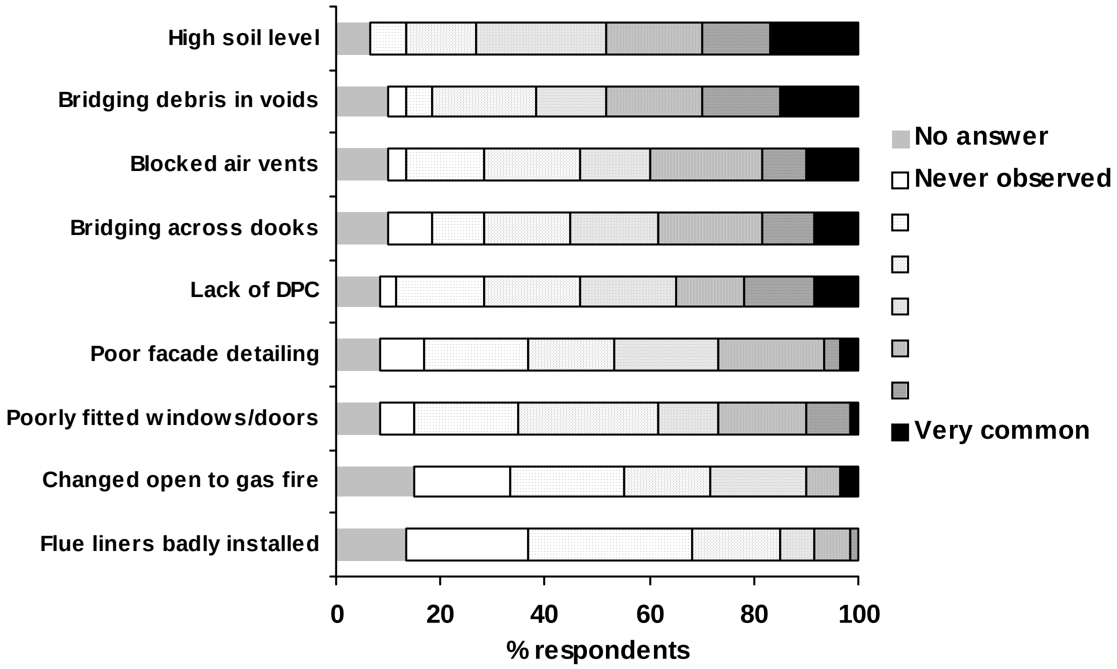
Factors promoting moisture flow to internal surfaces were most commonly cited. These included occasions when the external soil level was higher than the damp proof course, lack of a damp proof course, moisture bridging across dooks or debris in voids. Occupants blocking air vents was also a commonly encountered problem. Problems with design (poor façade detailing to control rainwater run-off) and workmanship in terms of poorly fitted windows, doors or flue liners were less commonly encountered. Changing from open fires to gas fires was not thought to be a common cause of problems by most practitioners. While defects can be fixed and building occupants can be advised on adequate ventilation, inadequacies in façade detailing cannot be easily remedied and it is disappointing that poor detailing in original designs is felt to be a significant contributory factor with respect to dampness problems. 'Expert' opinion largely agreed with the above, but would place moisture bridging across dooks above blockage of air vents in terms of importance (Figure 1.9).

Other factors noted by respondents included:

Road/pavement salting in certain urban areas,
Roof detailing generally,

Poor maintenance,
Lack/failure of dpc or dpm or omitted cavity trays,
Installation of dpc,
Slappings through walls.

Figure 1.9 Answers to the question "How often have you found the following to be involved in damp problems?" Factors are summarised in the graphs. The full descriptions of each factor were as follows:
External soil level higher than damp-proof course
Bridging debris in wall voids or cavity
Occupants blocking air vents
Moisture bridging across wall dooks
Lack of damp-proof course
Poor façade detailing to control rainwater run-off
Poorly fitted windows/doors
Change in use from open fire to gas fire
Flue liners not properly installed



To get further details on practitioners' knowledge about the effects of various factors related to mortar and pointing (Figure 1.10), respondents were asked, *"In granite buildings, do you think that some damp problems may be related to the following characteristics of mortar or pointing?"* The factors listed were:

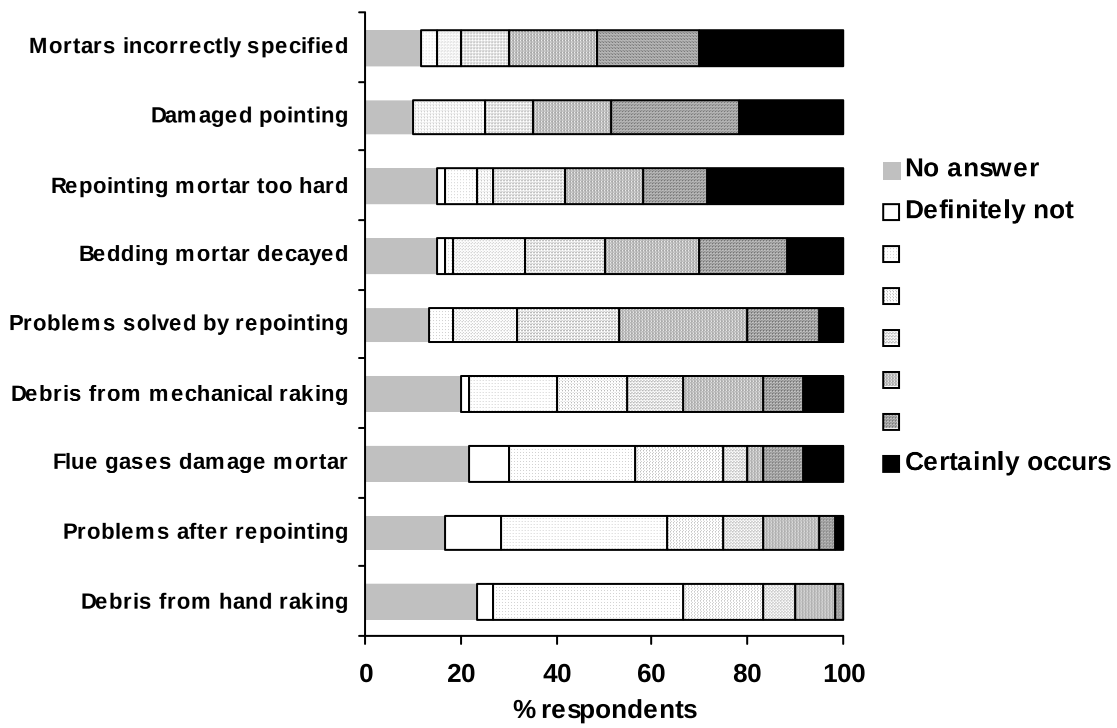
- *Does much moisture penetration occur through damaged pointing*
- *Are many damp problems solved by repointing*
- *or, have you found that damp problems begin after repointing*
- *Does mechanical raking out cause debris build-up in voids/cavities*
- *Does raking out by hand cause debris build-up in voids/cavities*
- *Do you think mortar mixes are often incorrectly specified*
- *Do you think repointing mortar mixes are often too hard*
- *Does decay of bedding mortar lead to moisture penetration*
- *Have you noticed that bedding mortar is damaged by flue gases*

Other comments by practitioners included:

Needs lime based mortars rather than cement-based mortars,
Pointing should include lime to allow drying out of structure,
If pointing is not carried out correctly then problems can be worse than before work started,
To solve damp problems the building must be assessed in a holistic manner- there may be a number of routes for water penetration. It is important to identify the primary source/s,
We would not expect bedding mortar to provide a water proofing function in a granite wall, as such it would not be fully waterproof even when in good order,
Dampness through wall and mortar is allowable. The important thing is to keep internal framework/lining independent using dpc.,
It is often the case when pointing at granite blocks is in a poor condition that any ingress of water finds its own way out,
In my opinion pointing is not a primary factor in moisture penetration except perhaps as skew tabling, and where pointing of rubble walls has been completely washed away by faulty downpipes.

Respondents thought that the most important of these factors was incorrect specification of mortar mixes, specifically, mortar mixes being too hard (Figure 1.10). Damaged pointing was also thought to be a very significant factor. Cracking of pointing mortar is more likely to occur where the mix is too hard. A large number of respondents also thought that decay of bedding mortar was probably an important influence on some damp problems. A relatively small number of respondents had noticed flue gases causing damage to bedding mortar.

Figure 1.10 Answers to the question "In GRANITE buildings, do you think that some damp problems may be related to the following characteristics of mortar or pointing?" Factors are summarised in the graphs. The full descriptions of each factor were as follows:
Do you think mortar mixes are often incorrectly specified
Does much moisture penetration occur through damaged pointing
Do you think repointing mortar mixes are often too hard
Does decay of bedding mortar lead to moisture penetration
Are many damp problems solved by repointing
Does mechanical raking out cause debris build-up in voids/cavities
Have you noticed that bedding mortar is damaged by flue gases
Have you found that damp problems begin after repointing
Does raking out by hand cause debris build-up in voids/cavities

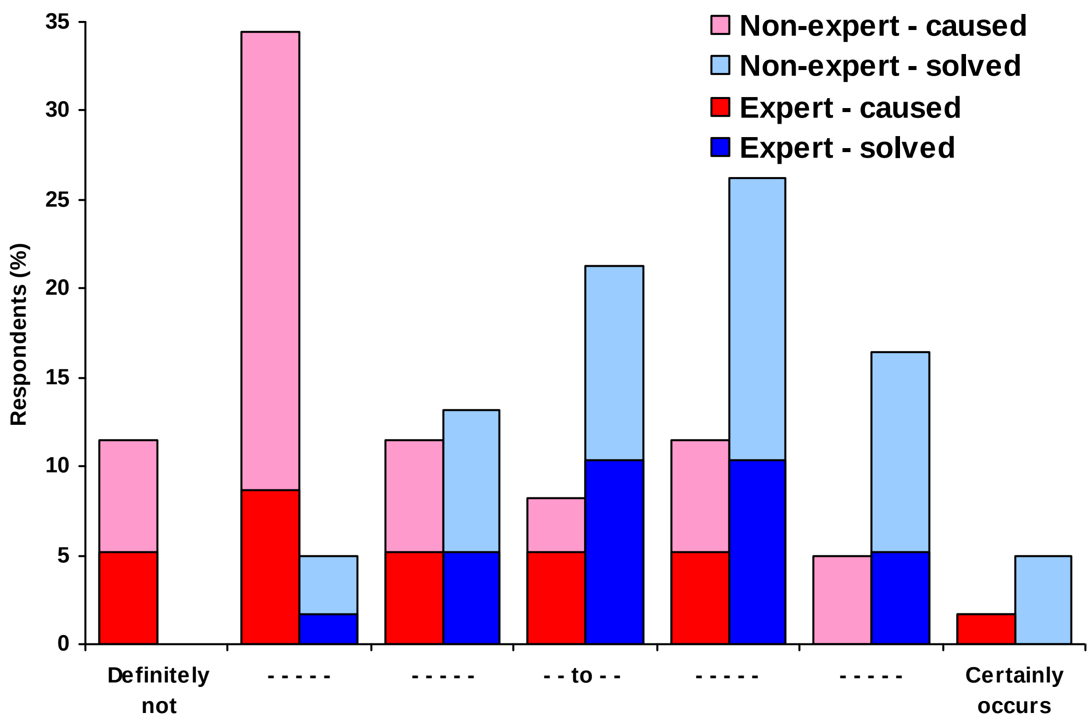


With respect to whether damp problems are often solved by repointing, or whether they may begin after repointing - on average most practitioners felt that repointing could solve damp problems (Table 1.5 & Figure 1.11). A minority had noticed damp problems beginning after repointing and 13% thought that repointing normally caused more problems than it solved. 'Experts' were more cautious - a relatively higher proportion than among the 'non-experts' thought repointing could be both a solution and a cause of damp problems, and they were also more cautious about its effectiveness in treating existing damp problems.

Table 1.5 Practitioners opinions with respect to whether repointing walls solves damp problems.

	Number holding opinion (%)		
Repointing ...	**All**	**'Experts'**	**'Non-experts'**
... more often solves than causes damp problems	55	45	60
... more often causes than solves damp problems	13	10	15
... can be both a cause and solution to damp problems	8	20	3
... is not very effective as a treatment	5	10	3
No opinion	18	15	20

Figure 1.11 Practitioners opinions with respect to whether repointing solves or causes damp problems. Showing relative proportions of 'expert' and 'non-expert' opinion in each category.

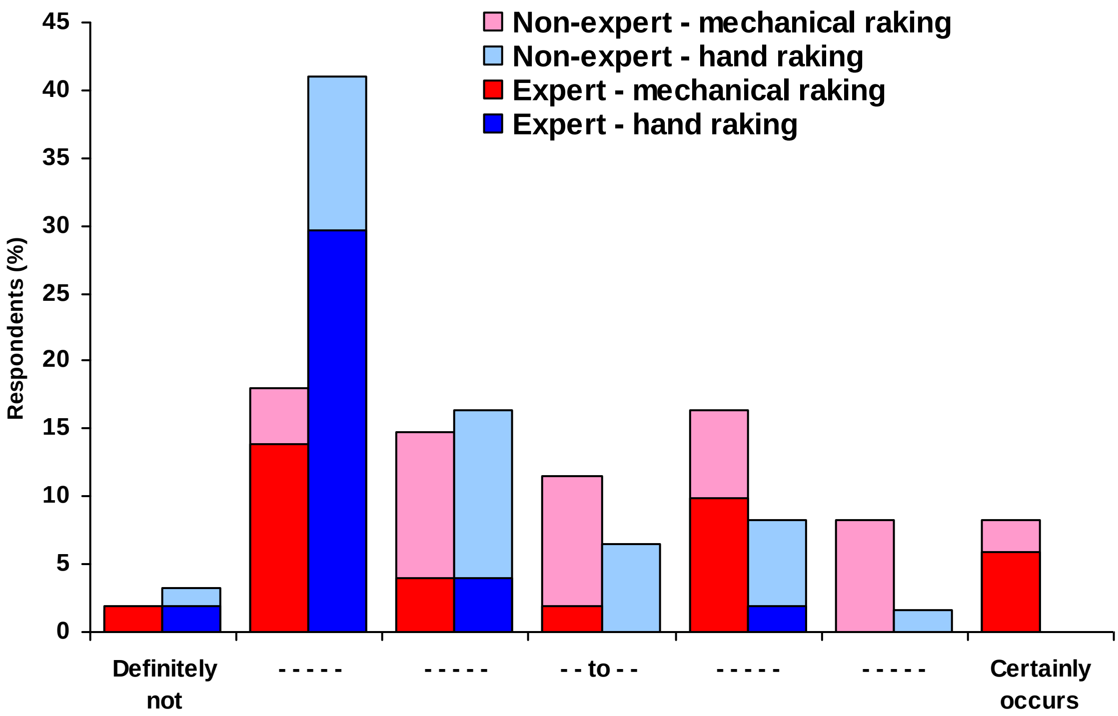


The method of raking out of old pointing may be a significant issue. While very few practitioners thought that hand raking led to debris build-up in voids and cavities, rather more practitioners thought mechanical raking out could cause debris build-up (Table 1.6 & Figure 1.12). Moisture bridging across debris in voids was one of the most commonly observed problems (Figure 1.9) and some 43% of practitioners thought mechanical raking out of joints caused significantly more debris build-up than hand raking. However, 20% overall (and 40% of 'experts') thought that raking out (whichever method was used) had no substantial effect on build up of debris in voids.

Table 1.6 Practitioners opinions with respect to whether the method for raking out joints causes build-up of debris in voids or cavities.

	Number holding opinion (%)		
	All	**'Experts'**	**'Non-experts'**
Mechanical raking out causes more debris build-up	43	50	40
Hand raking out causes more debris build-up	3	0	5
No difference between methods	10	5	13
No substantial effect with respect to debris in voids or cavities	20	40	10
No opinion	23	5	33

Figure 1.12 Practitioners opinions with respect to whether the method for raking out joints causes build-up of debris in voids or cavities. Showing relative proportions of 'expert' and 'non-expert' opinion in each category.



Respondents were asked which methods they had used to tackle damp problems and for their opinion on how successful each method had been (Figure 1.13). Ranked in descending order of practitioners' experience with methods and the degree of success reported, the methods used included:

- *Correct defects in gutters/downpipes* *(Correct gutters/downpipes)*
- *Correct defects in slates/tiling* *(Defects in slates/tiling)*
- *Correct defects in tilted fillet/skews* *(Defects in tilted fillet/skews)*
- *Improve drainage around wall base* *(Improve drainage)*
- *Replacing decayed pointing* *(Replace pointing)*
- *Improving ventilation of rooms* *(Improve ventilation)*
- *Capping flues* *(Capping flues)*
- *Clearing our debris from wall cavity* *(Clear our debris)*
- *Harling the exterior wall* *(Harling)*
- *Install barrier treatments for rising damp* *(Barrier treatment)*
- *Taking down and rebuilding a wall* *(Rebuild wall)*

- *Replacing permeable/soft pointing* *(Replace soft pointing)*
- *Electro-osmosis process for rising damp* *(Electro-osmosis)*
- *Install/replace flue liners* *(Install flue liners)*
- *Re-grouting bedding mortar in wall* *(Regrout bedding mortar)*
- *Apply water repellent coating* *(Water repellent)*
- *Replacing impermeable/hard pointing* *(Replacing hard pointing)*
- *Uncapping flues* *(Uncapping flues)*

(Descriptions used on Figures 1.13 & 1.14 are shown in brackets)

Some treatment methods were very commonly used (Figure 1.13), but others were used a lot less frequently. The most commonly used methods included treatments for obvious defects to roofs, guttering, etc. These were very often reported as being successful. For many other methods the reported results were quite mixed. It is easier to interpret the results from different treatment methods if we exclude respondents with no experience. These results are shown in Figure 1.14 and Table 1.7.

Improving ventilation is a simple remedy for many condensation problems and was successful in 76% of cases where it was tried. Even where dampness problems were not wholly resolved, improving ventilation normally resulted in a reduction in the scale of the problem.

It is clear that repairs to large-scale physical defects were often successful. With reported success rates over 90%, this includes repairs to defects in slates, tiling, fillets, skews, gutters and downpipes. Taking down and rebuilding a wall is a drastic intervention and was not very commonly done, but where it was carried out, it was almost always reported to be successful (96%).

Clearing out debris from voids or cavities was reported as being successful in 94% of cases where it was used. Most of this debris comes from decay of bedding mortar. Repairs to bedding mortar and pointing reported mixed levels of success. Pointing was replaced on the grounds of it being thought to be ‘too impermeable/hard’, ‘too permeable/soft’ or ‘decayed’. Practitioners reported that replacing pointing was fully successful as a treatment for dampness in only about 50-75% of cases. In most of the remaining cases repointing was partially successful. Regrouting walls to replace decayed bedding mortar was often reported to be successful (86%) although it is not commonly used as a method of treatment for penetrating damp. On the external façade, harling walls was also often successful (81%). Electro-osmosis treatment for rising damp was reported as being fully successful on 78% of the occasions it was used. It was never reported to have been entirely unsuccessful.

With respect to flues, capping flues to prevent water penetration (used by 70% of respondents) was reported to cure the problem in 78% of cases. Uncapping flues to prevent condensation problems was successful in only 60% of cases, and was seldom used by practitioners. Only 8% of respondents had found capped flues to be a source of condensation problems. Installing or replacing flue liners solved condensation problems in 76% of cases where this method was used (it was a relatively uncommon fault).

The lowest success rate was reported for water repellent treatment (46%). Water repellent treatment often (or normally) fails to address the cause/s of water penetration, so it is not surprising that it failed more often than not.

Other effective treatments mentioned by practitioners included:
Sealing the solum,
Removing coping stones & extending slates to wall-head,
Use of lime harl.

Analysis of the experiences of ‘experts’ and ‘non-experts’ with respect to the effectiveness of methods used to tackle damp problems revealed no statistically significant differences for individual treatment methods (using chi-squared test for independence, Table 1.8). In combining data from several treatment methods there was an interesting trend with respect to the relative success of repointing - the more experience practitioners had, the less success they reported with repointing (Figure 1.15) (combining data for hard, soft and decayed pointing). This is an unexpected result as one would expect increased expertise to lead to greater success, consider for example a similar graph for reported success in correcting major physical defects (Figure 1.16) - combining data for slates, tiling, tilted fillet, skews, gutters and downpipes.

Figure 1.13 Methods used by respondents to tackle damp problems and their degree of success. "Yes" implies that the method has been used and that it did work in treating damp problems. "No" implies that the method was used but did not work. Some methods also worked "Temporarily" or "Partially". Respondents who did not report any results for particular methods are recorded as "No experience".

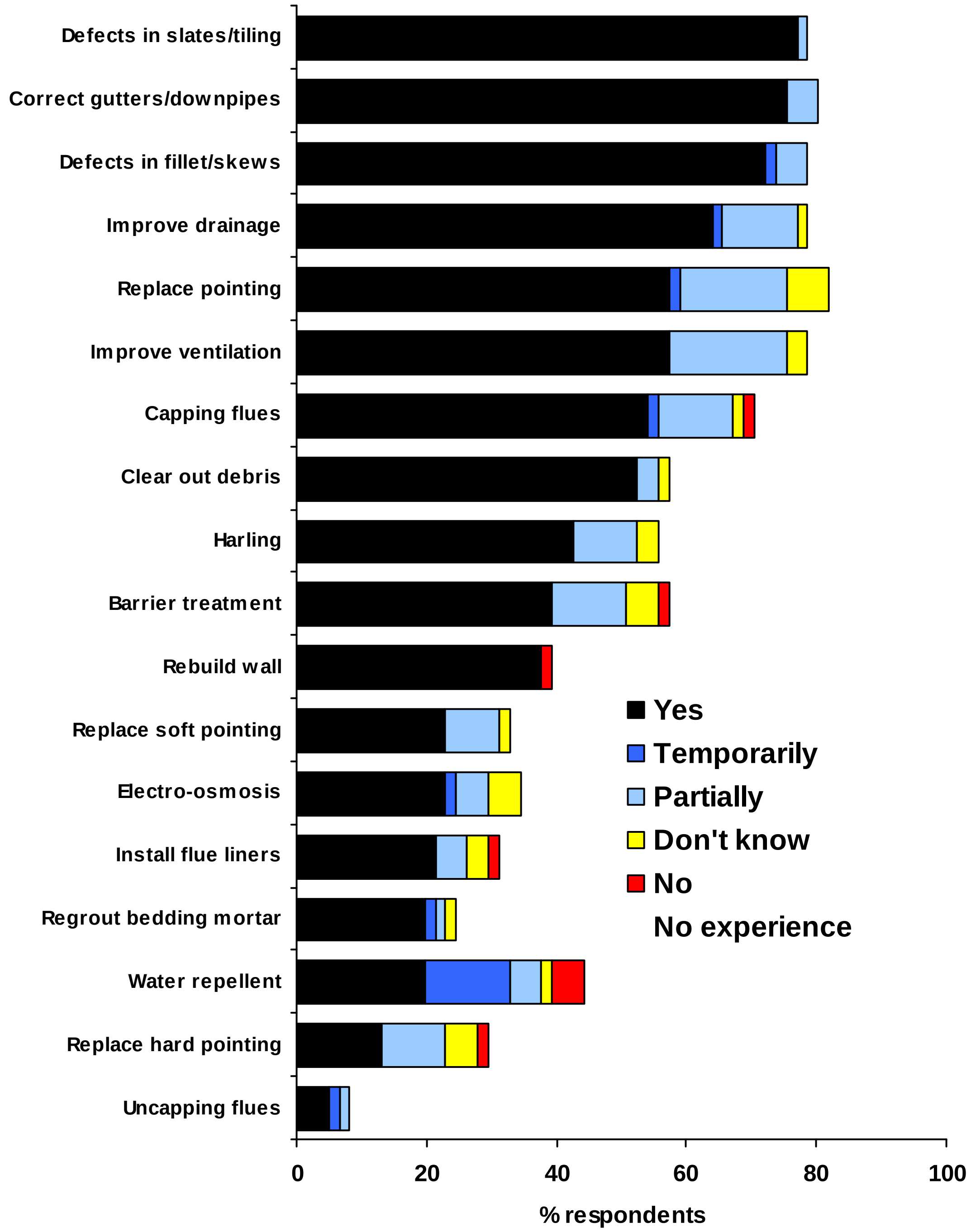


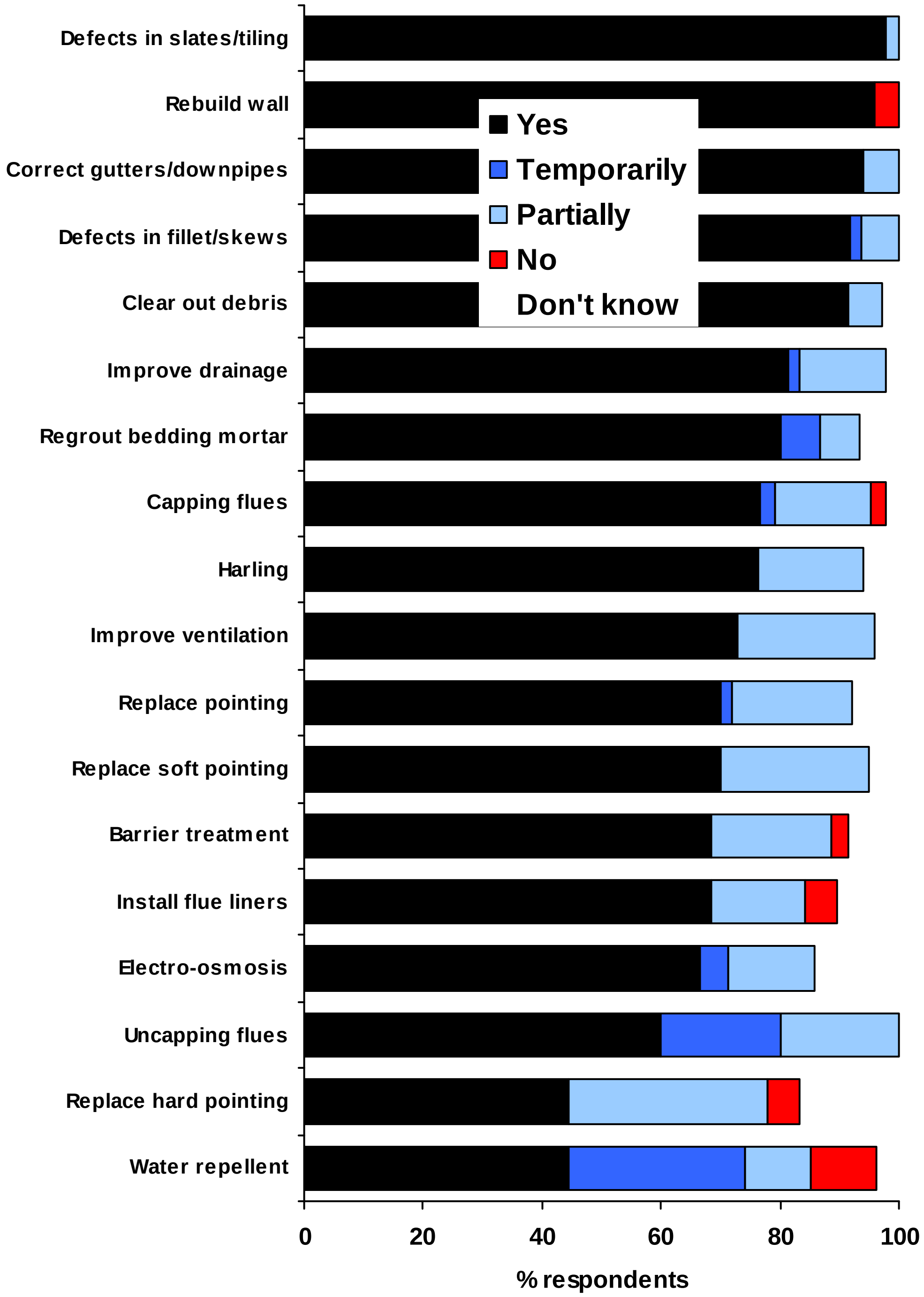
Table 1.7 Was the treatment successful? Excluding respondents with no experience of, or opinion on, particular treatments. “Yes” implies that the method worked, “No” that it did not. Methods might also be “Temporarily” or “Partially” successful.

Method	Yes (%)	No (%)	Temporarily (%)	Partially (%)
Correct defects in slates/tiling	98	0	0	2
Taking down and rebuilding a wall	96	4	0	0
Clearing out debris from wall cavity	94	0	0	6
Correct defects in gutters/downpipes	94	0	0	6
Correct defects in tilted fillet/skews	91	0	2	6
Re-grouting bedding mortar in wall	86	0	7	7
Improve drainage around wall base	85	0	2	13
Harling the exterior wall	81	0	0	19
Capping flues	78	2	2	17
Electro-osmosis process for rising damp	78	0	6	17
Install barrier treatments for rising damp	77	3	0	19
Install/replace flue liners	76	6	0	18
Improving ventilation of rooms	76	0	2	22
Replacing decayed pointing	76	0	0	24
Replacing permeable/soft pointing	74	0	0	26
Uncapping flues	60	0	20	20
Replacing impermeable/hard pointing	53	7	0	40
Apply water repellent coating	46	12	31	12

Table 1.8 Statistical analysis of difference between ‘expert’ and ‘non-expert’ opinion with respect to methods used by respondents to tackle damp problems. Chi-squared test for independence. Degrees of freedom = 3. Critical value for p<0.05 = 7.81. Data are arranged so that methods for which there was the smallest difference of opinion are shown towards the top of the table. NB Statistically, there were no significant differences of opinion between ‘experts’ and ‘non-experts’.

Method	Sample size (n)	Chi-squared value	Significant difference?
Improving ventilation of rooms	46	0.00	No
Correct defects in gutters/downpipes	48	0.01	No
Electro-osmosis process for rising damp	18	0.44	No
Taking down and rebuilding a wall	23	0.46	No
Correct defects in slates/tiling	47	0.58	No
Harling the exterior wall	32	0.80	No
Install barrier treatments for rising damp	31	0.88	No
Install/replace flue liners	17	1.36	No
Clearing out debris from wall cavity	33	1.38	No
Apply water repellent coating	26	1.55	No
Uncapping flues	5	2.22	No
Improve drainage around wall base	46	2.36	No
Capping flues	41	2.50	No
Re-grouting bedding mortar in wall	14	2.98	No
Correct defects in tilted fillet/skews	47	3.55	No
Replacing impermeable/hard pointing	15	4.31	No
Replacing permeable/soft pointing	19	5.43	No
Replacing decayed pointing	46	7.27	No

Figure 1.14 Methods used by respondents to tackle damp problems and their degree of success - excluding respondents with no experience of, or opinion on, particular treatments. "Yes" implies that the method worked, "No" that it did not. Methods might also be "Temporarily" or "Partially" successful.



Further comments by practitioners included:

In most damp properties investigated, the cause of dampness can generally be attributed to a combination of several causes. Too many people with little knowledge are involved in the damp proofing/contracting arena.

Unusual for dampness to be caused by one defect - more likely combination of defects therefore usually more than one remedy required.

Most problems due to poor roof RWP chimney etc details - lack of proper maintenance. Significant problem with condensation of masonry wall running down inside face of wall then bridging across debris to plaster finishes.

In my view too much emphasis is placed in repointing with 'traditional' soft lime mixes and the 'fashion' for exposed rubble walls with recessed pointing exacerbates this. Most granite walls (in outlying areas at least) were traditionally sand harled. All these walls allow dampness to penetrate to some degree. In my opinion, in bygone days, the huge through-flow of air due to open fires helped dry out buildings internally, whereas nowadays we try to seal all draughts. Also a chimney in use obviously prevents moisture ingress from this location.

I'm personally still a believer of 'part pointing' & if carried out properly does not, in my opinion, cause problems. Many Aberdeen tenements were originally part pointed and lasted 80-90 years - especially good with snecked ashlar blocks.

Providing an exit for moisture through a permeable outer skin & ensuring adequate ventilation & consistent heat will often keep levels of interior damp acceptable in older buildings without expensive remedial work. Maintaining roof & rainwater goods helps too.

Initial detailing of new buildings is the key. Understanding traditional construction by building professionals BEFORE starting work would also help. Making it easier for occupiers/ maintenance staff to access gutters/valleys/parapets to clear out debris is essential.

Perhaps the most significant factor in dampness is lack of maintenance due to poor understanding by 'professionals' of traditional building construction & who do not assess the building in a holistic way. Owners also are not prepared to carry out routine maintenance due to perceived cost.

I have found damp problems have become more common in recent times for properties apparently in sound condition & suspect this is due to ingress at skews lacking dpc, rubble bridging & hard cement mortar pointing possibly not 'breathing' & drying out effectively. A combination of lime mortar externally & smooth render to inside of wall (to minimise falling debris) may be best solution.

Once dampness has taken 'hold' it is very difficult sometimes to establish the real source/cause and establish which way to treat it to alleviate/eradicate. In houses people do not believe in 'letting it breathe'. I invariably find 'permavents' closed or boarded up, fans stuffed with newspaper etc. People do not like to be told how they should 'live' in their own homes and fail to accept that they need fresh air to breathe just as does the building.

Figure 1.15 The influence of level of experience on practitioners' reported success with respect to repointing as a treatment for damp penetration. This combines reported results of repointing to replace decayed, too hard and too soft mortar.

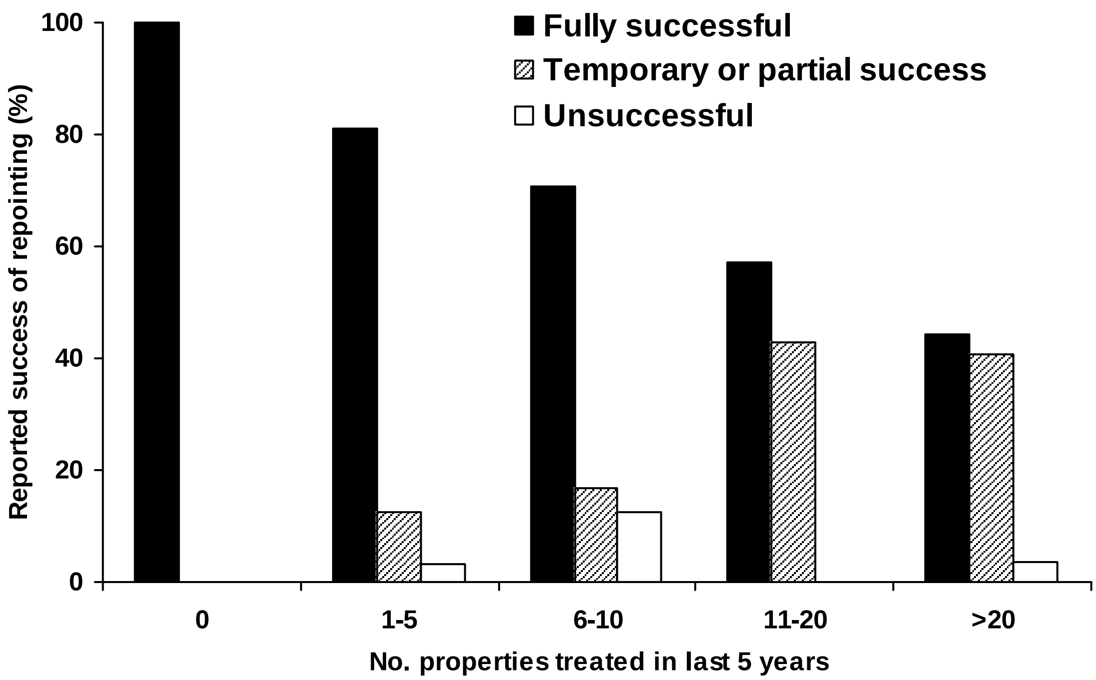
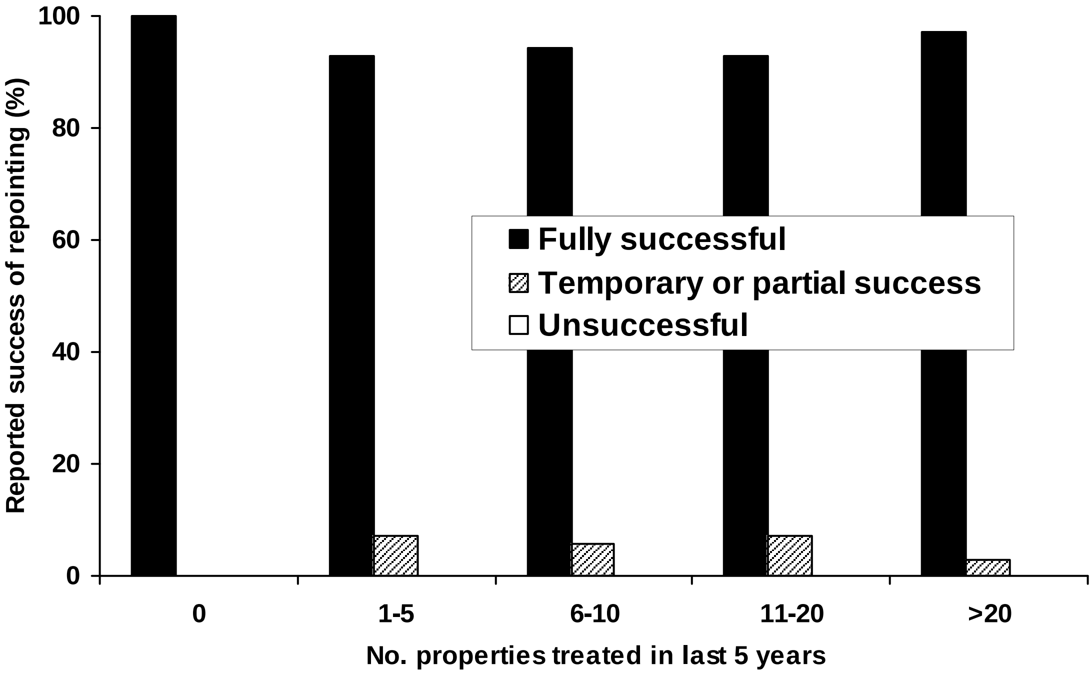


Figure 1.16 The influence of level of experience on practitioners' reported success with respect to repairing major physical defects as a treatment for damp penetration. This combines reported results of repairs to slates, tiling, tilted fillet, skews, gutters and downpipes.



Conclusions to questionnaire study

Questionnaire respondents had a wide range of experience with damp problems in buildings, from those with little or no practical experience to those who deal with more than 5 properties per year. Practitioners' level of experience can have a significant effect on their opinions with respect to damp problems.

There was no consensus of opinion as to whether damp problems have recently become more or less frequent. Most commonly, practitioners thought there had been little change in the frequency of damp problems. However, responses suggest that problems with moisture penetration are relatively more frequent relative to condensation problems than the national average (data from Scottish House Condition Survey, 1996). This may be attributable to local construction methods and materials. Damp problems were particularly common where granite walls were 'plastered on the hard', and were fairly common where there were solid granite masonry walls with lath and plaster.

Facing direction of gables may be a relevant factor in some instances, as many more experienced practitioners felt that prevailing northerly and north-easterly winds, in combination with low levels of sun exposure contributed to dampness problems.

With respect to specific causes of damp problems, the most common causes of moisture penetration were failures at roof level or of water shedding details, such as downpipes, gutters, skews, tilted fillets and slates. Closer to the ground, high external soil levels and lack of DPC were clear causes of damp penetration.

The most common cause of condensation problems was lack of ventilation (in rooms and voids) and related problems including condensation from gas fires, blocked off fireplaces and blocked air vents. Although practitioners often noted problems caused by water vapour produced by Calor gas heaters and the like, they did not consider change in use from open to gas fires to be a significant problem.

Excluding commonly encountered physical defects, expert opinion was that uncapped, disused chimneys were the main problem with respect to moisture penetration. However, inadequate ventilation of capped flues was often cited as a major cause of condensation problems. On a scale of

1 to 7, where 1 represents ‘never occurs’ and 7 represents ‘very common’, the opinion amongst ‘experts’ was that the average ratings for these two problems were:

Moisture penetration down uncapped flues: 5.7
Condensation in capped flues: 4.5

That is, both these factors were felt to be significant causes of dampness problems.

Factors related to pointing and bedding mortar were often considered to be important in relation to moisture penetration. Cracked pointing was a commonly encountered defect leading to water ingress and many practitioners felt that mortars are often incorrectly specified and too hard - and therefore likely to lead to formation of cracks in pointing. Water penetration through undamaged pointing was thought to be a negligible problem. Repointing was commonly carried out to remedy damp problems and was often reported as being a successful treatment, although a significant minority of practitioners was aware that damp problems occasionally occurred following repointing. Despite practitioners commonly noting hard cement pointing as being a common problem, replacing hard pointing was only reported to be a successful remedy for water penetration in about half the instances where it was tried. It is notable that more experienced practitioners reported lesser degrees of success with repointing. This is a counter-intuitive result - it would be expected that more experienced practitioners would be more successful. It strongly suggests that there is a problem related to repointing. It is not clear whether this problem lies in the mortar mix, the methods used or in the raking out process prior to pointing. Problems that arise after repointing may be related to the previously mentioned incorrect specification of mortars, however, respondents were quite often aware of damp problems arising from moisture bridging across debris build up in voids and cavities. Debris can be dislodged by vibration during raking out of joints, and this was reported to occur more often with mechanical tools than when hand raking was used. Moisture bridging does not necessarily require the presence of debris; another commonly reported problem was moisture bridging across dooks.

Problems related to bedding mortar were less commonly observed, although its decay was mentioned as a contributory factor. Most respondents were aware that flue gases could damage bedding mortar, although it was not thought to be a major problem in relation to dampness. Lack of flue liners was cited as a fairly common cause of condensation problems and in such a case bedding mortar would also be vulnerable to decay. Lime based bedding mortar acts like a sponge, absorbing moisture that enters the wall, conducting it readily through the network of pores and allowing it to evaporate. Decay of bedding mortar will inhibit the natural absorption and evaporation of moisture in the wall.

On the external wall surface, removal or loss of harling can cause problems on walls that were not designed to cope with direct rain water. Replacing harling can often solved damp penetration problems. Problems attributable to poor façade detailing were not common, but were occasionally encountered

With few exceptions, water repellents are not useful in preventing or reducing damp problems. They can be useful on sloping surfaces where biological growth would otherwise present a serious aesthetic problem, but they do not tackle the sources of most damp problems. Water repellents will prevent moisture ingress through a stone surface, but this is not likely to be a significant problem. Most moisture gets in through cracks and other defects, which water repellents cannot seal. Once inside a wall the water repellent may inhibit drying out, exacerbating the problem.

Successful treatment depends on correct diagnosis of the defect or defects leading to the problem. This is not always easy, but where there were obvious defects in roofing materials or in control of rainwater runoff, remedying these defects was almost always successful in treating dampness. Defects in skews or tilted fillets were commonly encountered and one practitioner notes that this can be successfully remedied by removing coping stones and extending slates to the wall head.

Improving ventilation proved to be a simple and effective remedy in many instances. Even where dampness problems were not entirely resolved, improved ventilation was often reported to reduce the scale of the problem. Inadequate ventilation inside capped flues was very infrequently found to be a problem; only 8% of respondents had experience of this. In addition, the data suggest that uncapping flues was successful in only 60% of cases where it was used, achieving only temporary or partial success in the remainder of occasions. Is it possible that on these occasions a condensation problem has been removed at the expense of causing a moisture penetration problem? Problems with flues were more often related to moisture penetration and 70% of practitioners had capped flues to prevent water ingress through this route.

On some occasions substantial intervention was required. About 40% of practitioners had experience of taking down and rebuilding a wall to resolve damp problems. This was almost always completely successful (only one respondent replied that the problem was not resolved).

Build up of debris in voids and cavities was a commonly encountered problem and clearing out this debris was often successful in preventing moisture bridging to internal surfaces. Most of this debris comes from decay of bedding mortar. Regrouting walls to replace decayed bedding mortar is not commonly used, but was often reported to be successful. External pointing is easier to replace and is commonly done, however, practitioners reported that replacing pointing was fully successful in only 50-75% of cases.