Chapter 2
Construction Quality Assessment System

2.1 Evolution of CONQUAS

2.1.1 History and Development

In 1989, the first edition of CONQUAS was introduced to evaluate the quality performance of building contractors in the public sector (Tang et al. 2005). Subsequently, CONQUAS was applied to the superstructure works of private building projects in 1991 as well as development on sites sold by the Housing and Development Board and the Urban Redevelopment Authority and civil engineering works construction in 1993 as a way to assure quality even in other sectors. In the fifth edition launched in 1998, known as CONQUAS 21, the assessment of Mechanical and Electrical (M&E) Works was included to replace the External Works component to make CONQUAS scoring more accurate and customer-oriented (Chiang et al. 2005). Industry concerns and end-user feedback continued to shape CONQUAS 21 BCA (2005). After a review focusing on latent defects, the sixth edition launched in 2005 introduced the wet-area water-tightness testing and in-process inspection for internal wet-area waterproofing works to ensure better quality assurance and higher CONQUAS scores. Following that, the seventh edition became applicable in 2008 where the defect level weightages for internal finishes assessment are raised for a more accurate reflection of homeowner priorities on defects. Hence, this study will be based on the seventh edition, which can be found from the following web link:

http://www.bca.gov.sg/professionals/iquas/others/CONQUAS_7edit.pdf

However, it should be noted that the latest eighth edition, which was launched on 31st October 2012 (mid-way during this study), can be found in:

http://www.bca.gov.sg/professionals/iquas/others/CONQUAS8.pdf

In a nutshell, CONQUAS is reviewed periodically due to changes and improvements in processes, technology, strategies and methods of construction, which are continuously evolving in the industry. Hence, it is necessary to constantly align the CONQUAS standard with industry trends to keep it current and relevant.

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Table 2.1 Bonus and discount threshold score from 1/4/2012 to 31/3/2013

Building category	Discount threshold score	Bonus threshold score
Residential	82.6	88.6
Commercial	82.0	88.0
Institution	80.0	86.0
Industrial/others	79.1	85.1

Source BCA (2012)

Table 2.2 Merit and default points

CONQUAS score (%)	Merit/default points
>(A + 15)	5 merit points
(A + 12.1)–(A + 15)	4 merit points
(A + 9.1)–(A + 12)	3 merit points
(A + 6.1)–(A + 9)	2 merit points
(A + 3.1)–(A + 6)	1 merit point
(A − 3)–(A + 3)	Nil
(A − 6)–(A − 3.1)	1 default point
(A − 9)–(A − 6.1)	2 default points
(A − 12)–(A − 9.1)	3 default points
(A − 15)–(A − 12.1)	4 default points
(A − 20)–(A − 15.1)	5 default points
< (A − 20)	10 default points (debarment to be considered)

Note A is the average CONQUAS score for the particular building category

Source BCA (2012)

2.1.2 Bonus Scheme for Construction Quality

CONQUAS 21 was launched together with the BSCQ whereby a contractor of a public project would have a 0.2 % bonus or discount of the effective contract sum for every point scored above or below the bonus or discount threshold score. The bonus or discount threshold scores are set at three points above and three points below the previous 24-month average CONQUAS score for the relevant building category as shown in Table 2.1. This would give them a preferential advantage of up to 3 % of the effective contract sum or S$2 million, whichever is lower, over their competitors when tendering for government projects. As a result, contractors have become more conscious of quality as those who performed poorly would be penalised with disincentives (BCA 2009).

Furthermore, based on the latest five contracts, when a contractor accumulated CONQUAS default points as explained in Table 2.2, a price-loading of 0.2 % for each CONQUAS default point, subject to a maximum of S$2 million, would be applied against any tender proposal by the contractor in the evaluation of tender. An example of how this price-loading affects the tender evaluation process is shown in Table 2.3. Apart from that, once the contractor accumulates more than

Table 2.3 Example of application of price-loading

Firm	Total tender sum (S$m) and accumulated default points	Effective tender sum (%)	Price-loading factor (%) (0.2 % for each default point)	Computation of price-loading (S$m)	Applicable price-loading (S$m)	Effective tender value (S$m)
	(a)	(b)	(c)	(d) = (a) × (b) × (c)	(e) = (d) subject to S$2 m maximum	(f) = (a) + (e)
A	301.0 (2 default points)	90	0.4	1.0836	1.0836	302.0836
B	300.0 (4 default points)	90	0.8	2.16	2.0	302.0
C	301.3 (1 default point)	90	0.2	0.54234	0.54234	301.84234

Note In the above example, based on the effective tender value, Firm C would be awarded the tender at his tendered sum of S$301.3 million, even though Firm A and B have tendered lower actual prices of S$301 million and S$300 million, respectively

Source BCA (2012)

five CONQUAS default points, it will be downgraded by one financial grade for up to a period of twelve months. Alternatively, debarment will be recommended if the contractor accumulates ten or more default points.

Therefore, contractors who want to tender and win in a public project have to have a good track record of high CONQUAS scores. With that, chances of any penalties and disincentives will be minimised as well. To a large extent, relying on the BSCQ to enforce workmanship in contractors does assure that the buildings delivered will be of a certain quality (Mohammed and Tan 2001). Moreover, this policy has been welcomed by contractors as it is deemed to be an effective policy introduced by the government to drive the quality standards in the industry (Mohammed and Tan 2001). Coupled with the Construction 21—Reinventing Construction's vision of transforming the construction industry to be a world-class builder in the knowledge age (Construction 21 Steering Committee 1999), it is certainly important for contractors to devise a list of CSFs to the achievement of high CONQUAS score so that the level of built quality can be delivered with greater assurance.

2.1.3 Introduction of Quality Mark Scheme

The evolvement of CONQUAS is supported with the launch of the quality mark (QM) for Good Workmanship Scheme, which is issued to individual apartment unit for new residential projects. QM is mainly evolved from the CONQUAS Internal Finishes Quality standards. Each unit has to achieve a minimum of 80 points, and there should not be any leakages detected during the water ponding test and window water-tightness test (optional). This is to help and encourage developers meet the rising expectation of Singaporeans for better consistent quality homes. Although QM is completely voluntary, its take-up rate has increased steadily from 28 % in 2006 to 56 % in 2009 for the purpose of enhancing both developer's and contractor's branding (BCA Academy 2012c). The QM average unit score performance has also improved from 80.8 in 2006 to 83.9 in 2009, and this has been found to be correlated to its attainment of higher CONQUAS score as compared with non-QM private residential projects as shown in Fig. 2.1.

Nonetheless, there is a slight difference between CONQUAS and QM as depicted in Table 2.4. QM certification is for individual unit that provides a better indication of internal quality level only, while CONQUAS is a certification of the overall project quality which may actually varies from unit to unit. In fact, participation in QM has helped to propel Singapore's construction industry workmanship standards to a greater height, raising the percentage of building projects achieving a CONQUAS score above the benchmark. However, this has only been successful to private residential project (QM certified), while other types of projects (non-QM) are still far from achieving a CONQUAS score above the norm (BCA Academy 2012c). Even so, no matter whether projects are QM certified or not, it is vital that contractors have the skills and capability to manage CONQUAS by way of formulating a set of CSFs for achieving high CONQUAS scores.

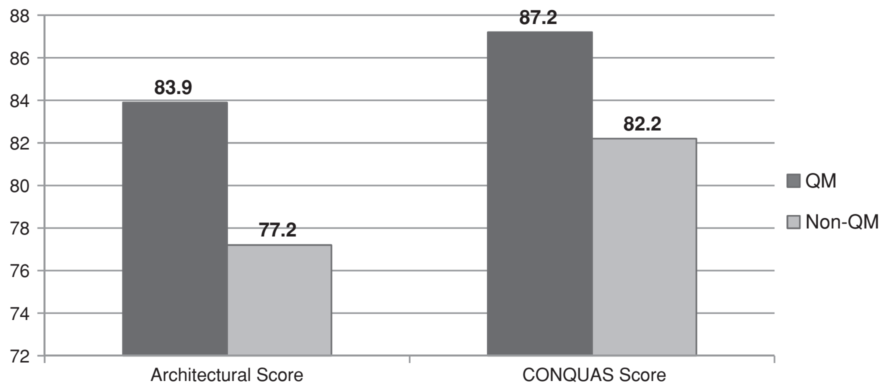

Fig. 2.1 Average architectural and CONQUAS score for QM and non-QM private residential projects from year 2006 to 2009. *Source* BCA Academy (2012c)

Table 2.4 Difference between CONQUAS and QM scheme

Criteria	CONQUAS	Quality mark
Applicant	Main contractor	Developer
Assessment fee	Based on gross floor area (GFA) of project	Based on unit rate for: Condominium development Landed housing
Scope of assessment	Structural works	Internal finish works
	Architectural works	Waterproofing test to bathrooms
	Internal finishes	Random in-process inspection on key trades:
	External wall/works	Waterproofing works
	Window water-tightness test	Marble/tiling works
	Pull-off test for wall tiles	Timber flooring works
	Material and functional tests	Window installation
	M&E works	
Assessment sampling/ approach	Sampling approach	Internal finish of all units
	Samples worked out based on GFA of project	Water ponding test of all bathrooms found in units
	1st time right approach	Allow re-score
Assessment outcome	CONQUAS certificate for project with score reflected	Quality mark certificate for every individual unit that meets the stipulated standard
	Two certificates issued: developer	Individual unit score not reflected on certificate
	Main contractor	Certificates are issued to developer only

Source BCA Academy (2012)

Table 2.5 CONQUAS score weightage system

Components	CAT A: commercial, industrial, institution and others (%)	CAT B1: commercial, industrial institution and others (%)	CAT B2: private housing (%)	CAT C: public housing (%)	CAT D: landed housing (%)
Structural works	25	30	25	35	30
Architectural works	55	60	65	60	65
M&E works	20	10	10	5	5
CONQUAS score	100	100	100	100	100

Note In general, projects with central cooling system having cooling tower, chiller system, etc. are classified under CAT A. Otherwise, it will be classified under CAT B1

Source BCA (2008)

2.2 Assessment Approach

The assessment is divided into three parts–structural works, architectural works and M&E works–with different weightages for each building category. This is aimed at making the CONQUAS score objective in representing the quality of a building to reflect the approximate cost ratio of each component in the various building types and their aesthetic consideration as shown in Table 2.5. The quality of workmanship will be assessed throughout the construction process for structural and M&E works. On the other hand, the workmanship quality for architectural works is assessed on buildings completed between one to three years which give rise to a higher chance of subjecting to lower CONQUAS scores as the workmanship quality may worsen upon being occupied by users. While the lower limit of one year helps to ensure that faults, if any, can be detected, the upper limit of three years will ensure that the building concerned can still be regarded as a relatively new development. Overall, CONQUAS provides a common objective and measureable platform for quantifying the quality standards within specific time and cost limits and in the process, raises the level of quality in construction BCA (2005).

Generally, the projects are assessed through site inspections, tests on materials and functional performance of selected services and installations, where the workmanship is evaluated and scored objectively by trained BCA assessors using standard score sheets BCA (2008). Figure 2.2 shows an example of an internal finishes assessment in the principal location. The required samples are chosen according to the ratio set out in the four categories of buildings for the principal (e.g. halls and rooms), circulation (e.g. stairs, corridors and lift lobbies) and service (e.g. kitchen, toilets and plant room) areas, respectively. This is vital as all three locations will ultimately affect the long-term performance of the building. Most importantly, scoring will only be done once and rectification or any correction carried out thereafter will not be re-assessed to encourage the approach of "doing things right the first time".

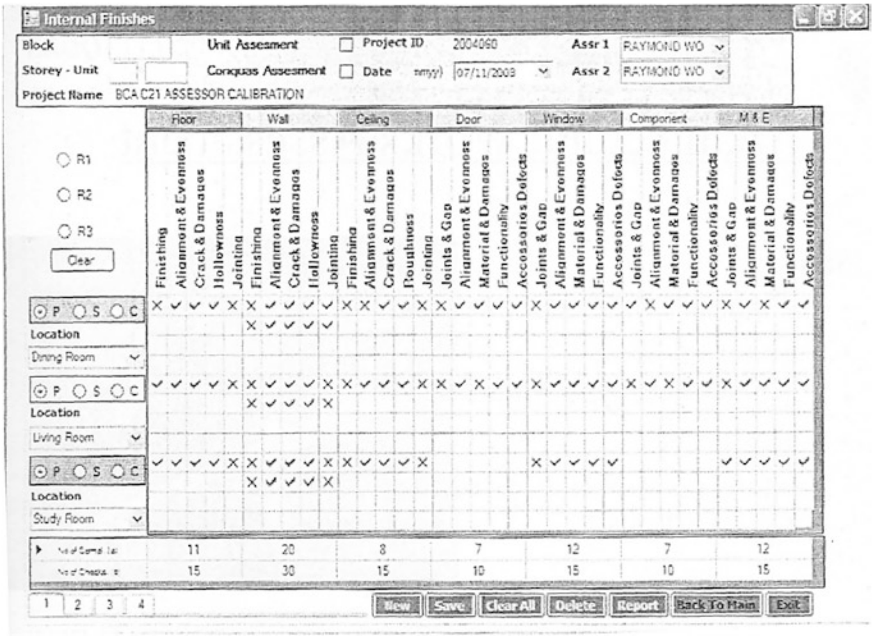

Fig. 2.2 Example of CONQUAS assessment internal finishes score sheet. *Source* BCA Academy (2012)

Table 2.6 Number of samples required for structural and architectural works

Components	CAT A and B1 commercial, industrial, institution and others			CAT B2 and D private and landed housing			CAT C public housing		
	GFA per sample (m^2)	Min.	Max.	GFA per sample (m^2)	Min.	Max.	GFA per sample (m^2)	Min.	Max.
Structural elements	500	30	150	1,500	30	50	1,500	30	50
Architectural internal finishes				70	30	800	70	30	600

Source BCA (2008)

2.3 Sampling Approach

The number of samples that is required to be prepared is believed to have affected the CONQUAS score. From Table 2.6, it is shown that the number of structural sample required for housing projects is thrice lower than non-housing projects. This is the main reason which accounts for the fact that structural works of housing projects tend to perform better than non-housing projects (Corenet 2012). As a result,

Table 2.7 Number of samples required for M&E works

Components	CAT A with central cooling system			CAT B1 and B2 without central cooling system			CAT C and D public and landed housing		
	GFA per sample (m^2)	Min.	Max.	GFA per sample (m^2)	Min.	Max.	GFA per sample (m^2)	Min.	Max.
Electrical, ACMV, fire protection, S&P	1,000	35	70	1,500	25	50	3,500	10	20
Basic M&E fittings	500	30	150	500	30	150	500	30	150

Source BCA (2008)

the total number of sample locations for internal finishes of housing project is notably more than seven times of non-housing project which is one of the reasons that causes its architectural works to score poorly. Moreover, architectural works have to be assessed on a free-look basis as compared with structural works where sample locations have to be planned beforehand. Thus, contractors will put in more effort in these planned structural locations but to do the same for all the architectural works would be tough.

Next, although M&E works are also randomly assessed, they are still able to score relatively well (Corenet 2012) due to the fact that M&E works have a relatively much lower number of sample locations required as compared with structural or architectural elements as shown in Tables 2.6 and 2.7. With that, it is suggested that to a certain extent, the CONQUAS sampling approach is deemed to have unwittingly manipulated the quality trend results.

Overall, the number of sample locations required for architectural works is the most out of the three components which signifies that more attention has to be paid to ensure that all architectural sample locations are thoroughly ready for CONQUAS assessment. Moreover, architectural works accounts for at least 55–65 % of the CONQUAS score depending on the category of building it belongs to, acting as a barrier to achieving a high CONQUAS score. Hence, it is important that contractors take note of the quality trends in each of the three components so as to allocate resources more appropriately and tailor a set of CSFs to overcome this shortcoming of CONQUAS assessment and cultivate a "first time right" mindset as well as to achieve high CONQUAS scores.

2.4 Quality Trends

In order to do so, industry players can look at the information on construction quality (IQUAS) website which provides a vast repository of CONQUAS assessment data to benchmark their performance on workmanship quality against the industry standards. A noticeable defect trend data on (Corenet 2012) found that the architecture works component has the highest percentage of non-compliance ever since CONQUAS was launched. This is further supported as the average score of architectural works is only 73.9 as compared with 86.6 and 86.5 achieved in the structural and M&E components, respectively (Corenet 2012).

In view of this, BCA developed a CONQUAS 21 Enhancement Series called the good industry practices (GIP) guides which aims to share with contractors good industry work practices adopted by contractors and practitioners who have been able to consistently deliver high-quality work, in other words, high CONQUAS scores. These guides, also available in the CONQUAS application, serve to help improve the contractor's quality standards with focus on the architectural aspect. The following twelve titles have been released since 2003:

- Ceramic Tiling (Second Edition)
- Marble and Granite Finishes (Second Edition)
- Waterproofing for Internal Wet Areas (Second Edition)
- Painting (Second Edition)
- Waterproofing for External Wall
- Timber Flooring
- Aluminium Window
- Timber Doors
- Wardrobes and Kitchen Cabinets
- Precast Concrete Elements
- Design and Material Selection for Quality—Volume 1
- Design and Material Selection for Quality—Volume 2

In particular, the use of dry walls on average has lead to a higher score of 87.2 % compared with 76.7 % achieved using conventional brick wall or reinforced concrete wall (BCA 2012b). In spite of this, architectural works has only achieved an overall improvement rate of 52 % from 2001 to 2011 as compared with the improvement rate of 84 and 68 % achieved in structural works and M&E works, respectively (BCA 2012b).

As a whole, the introduction of GIP is targeted at the upstream construction activities whereby selection of materials and design plans drawn up by the consultants is deemed to be of great consequence to the downstream activities of the contractors, playing a major role in influencing the workmanship quality on site. With that in mind, the following sections will highlight on the downstream workmanship quality trends for each assessment component.

2.4.1 Mechanical and Electrical Works

In this segment, 50 % of the score is for the M&E works on-site inspection, and the other 50 % is for the performance test assessment declared by the qualified personnel. It is observed that M&E works has the lowest number of defects non-compliance and a proportionately higher average score achieved than architectural works though slightly lower than structural works (Corenet 2012). Apart from the low number of sample locations required as mentioned, Griffith (2011) has recognised that there are much more national, regional and international standards including the Singapore Standards for M&E works and even structural components as compared with architectural components. This accounts for the relatively decent performance by M&E works as they have a reference point to understand and apply the correct system so as to attain the stipulated workmanship quality required.

2.4.2 Architectural Works

Besides the sampling and assessment approach that makes it more challenging to achieve high architectural scores, another reason for the poor performance of architectural works is largely due to the fact that they are the last trade to begin work. As the initial phase of the project is often delayed, architectural works have lesser time to complete subsequently (Fewings 2005). Consequently, the abundance of demanding interfacing works, trades and details in architectural works cannot be attended to attentively which caused workmanship standards to suffer, leading to an increase in percentage of non-compliance. In addition, during construction, it is evitable that labourers need to frequently access various areas to complete their work. Due to the lack of protection of the materials at the factory as well as during delivery at site and after installation, architectural trades, being the outer layer, are exposed to higher risk of deteriorating faster than how it should be subjected to wear and tear under normal operational conditions (Meier and Wyatt 2008). However, even though contractors play a major part in affecting the architectural scores, architects and owners cannot deny their responsibility as the method, system and technology chosen in consideration of their budget and needs also play a major role in affecting the quality of workmanship that contractors cannot control.

2.4.2.1 Internal Finishes

There are six elements assessed in internal finishes, and it is observed that the percentage of non-compliance achieved in each element have been rather stagnant since 2007 to 2011 as shown in Fig. 2.3. On top of that, the percentage of non-compliance of each and every element in 2011 is actually higher than the value in year 2000 which suggests that there has been no or little improvement and more has to be done to reduce the percentage of non-compliance for all elements. In particular, the jointing and gaps defect is present across all six elements with an exceptionally high percentage of non-compliance as compared with the other type

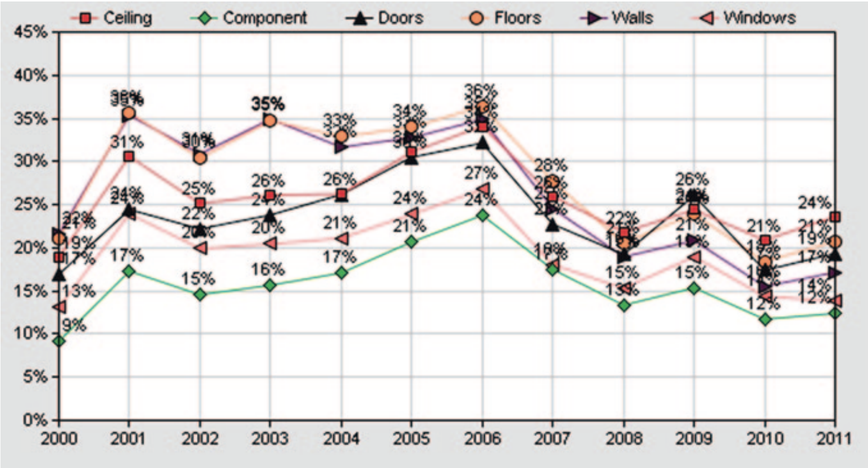

Fig. 2.3 Percentage of non-compliance for internal finishes from 2000 to 2011. *Source* (Corenet 2012)

of defects (Corenet 2012). Apparently, this seems to suggest that current measures have not been effective or rather, not utilised at all to reduce the number of non-compliance.

The GIP measures recommend that segregation of tiles based on production batch as well as the use of rectified (first-grade) tiles will assure a better workmanship quality. However, contractors may be concerned that more time and cost will be involved to achieve such workmanship accuracy (Chiang et al. 2005). Another GIP is the choice of using rebated door system with lift-off hinges whereby the doors are kept and will only be installed at a much later stage during the construction period to minimise damages as construction of other trades are still in progress. Alternatively, sub-frame door system is also encouraged compared with the traditional system. Similarly, although the costs of these unconventional door systems are much higher, they are easier and faster to install and more convenient to handle, which will lead to an easier means to achieve the required workmanship quality. Hence, contractors rather forgo such GIP and sacrifice the CONQUAS score in order to spend within budget and earn more profits, which is the priority of most contractors.

On the whole, the findings suggest that the use of such GIP is acceptable as long as it does not lead to great diminishing returns. This means that the achievement of high CONQUAS scores should not be at a significant expense of increased manpower and cost which is also the rationale behind the capping of CONQUAS score at 95 in the latest CONQUAS eighth edition, published in October 2012. This is supported by studies conducted by BCA (2012) which found that in order to increase the CONQUAS score from 95 to 97, just two points, requires a significant increase of 44 man-days as shown in Fig. 2.4.

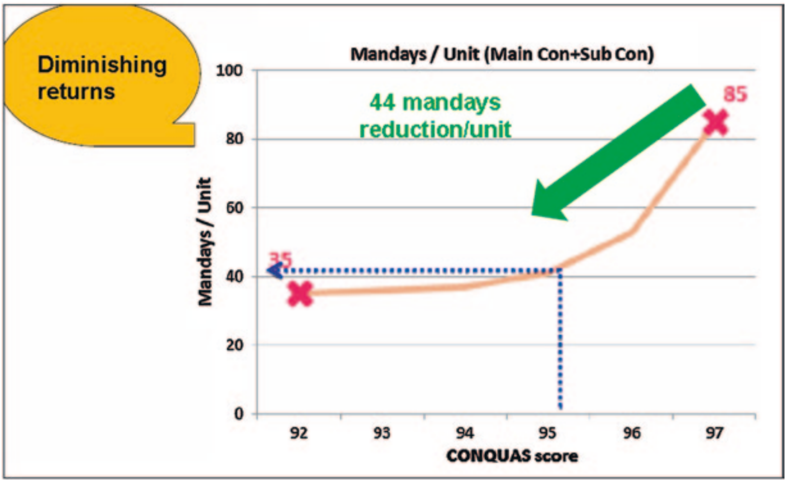

Fig. 2.4 Number of man-days versus CONQUAS score. *Source* BCA (2012)

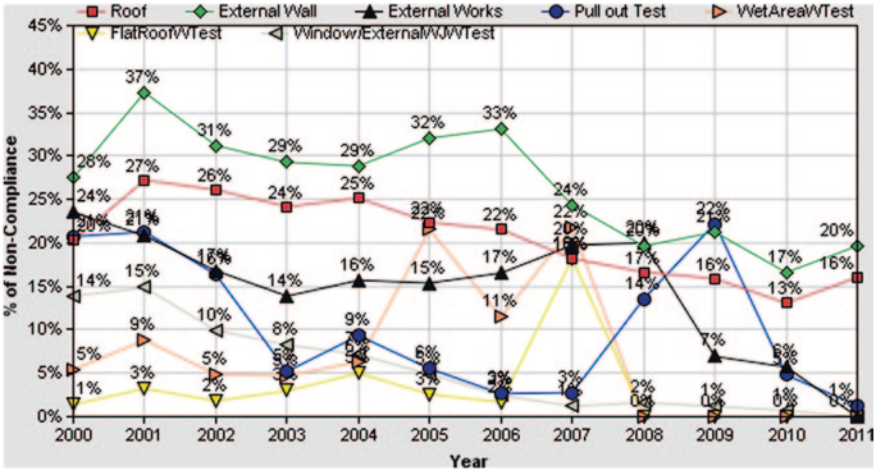

Fig. 2.5 Percentage of non-compliance for other architectural works from 2000 to 2011. *Source* (Corenet 2012)

2.4.2.2 Other Architectural Works

Although this segment has a much lower percentage of non-compliance as compared with the internal finishes segment and improvement has been passable (BCA 2012c), more can be done to further perfect the score of this segment so as to be on par with the almost perfect value achieved in the water-tightness test (WTT) elements from 2008 to 2011 as shown in Fig. 2.5. This may be due to the fact that self-testing is required, and hence, corrective actions can be done before the official test by BCA. In addition, BCA have to conduct an in-process

Table 2.8 Industry non-compliance average by assessment type

Type of defects	Industry non-compliance average (%)
Roof	22.66*
External wall	28.77*
External works	22.56*
Pull-Off test	11.29
Wet-area water-tightness test	8.73
Flat roof water-tightness test	3.25
Field window water-tightness test	5.93
Total	21.25

Source (Corenet 2012)

* The top three areas with a high percentage of non-compliance are indicated with an asterisk

inspection of the internal wet-area waterproofing process based on the approved method statement and shop drawings before actual works begins which contributes to the low level of non-compliance in the WTT. With that, BCA have decided to reduce the WTT weightage from ten points to nine points in the latest CONQUAS eighth edition so as to place more emphasis on better quality design and material choices.

Unlike internal finishes, the roof, external wall and external works are assessed after the temporary occupation permit is issued. Hence, contractors are advised to make an appointment for assessment as soon as possible due to the fact that these three elements are open areas and will be subjected to varying weather conditions. Such exposure will certainly affect the workmanship quality that was constructed in the first place which explains the industry trend of having a relatively high percentage of non-compliance in these three areas (indicated with an asterisk) as depicted in Table 2.8.

2.4.3 Structural Works

Structural works is deemed as the root cause of problem and any poor workmanship quality detected will affect subsequent trades, resulting in poorer workmanship quality of the end product (Hoonakker et al. 2010). The determination of nonconforming structural work is more difficult when the work has been covered by finish work or subsequent installations (Demkin 2008). Moreover, to fast-track construction, structural components are often poured at one go first without making openings for electrical services as the exact locations have not been confirmed yet during the early stage of construction (Fanella 2010). Demolishing parts of the structural component after that, will affect the workmanship quality of the final product which is also one of the reasons why these areas, are often not chosen to be part of the sample location. As mentioned earlier, samples for structural works are pre-planned by the main contractor, and this is an opportunity for them to set up a high level of workmanship standard for the assessment, which may be the reason why structural works performed the best out of the three components.

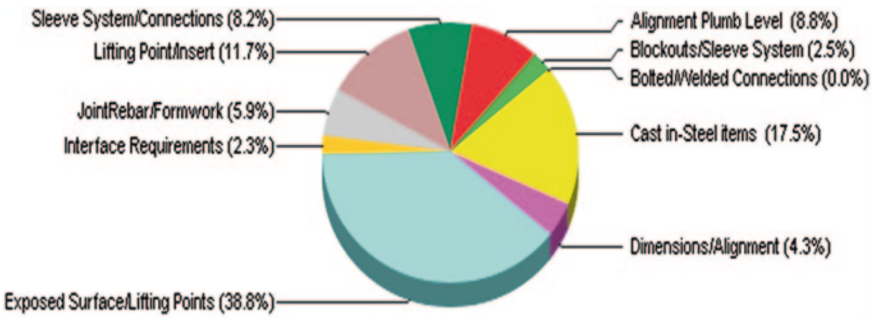

Fig. 2.6 Precast concrete defect distribution from 01/01/2000 to 30/04/2011. *Source* (Corenet 2012)

It is noted that precast concrete, prestressed concrete and structural steel work have relatively lower percentage of non-compliance (Corenet 2012) largely because these systems are produced under factory-controlled conditions (ACI 2008). In particular, the exposed surface criterion is a major contributor to the non-compliance for precast concrete as shown in Fig. 2.6. This is because of damages suffered due to lifting operations which is harder to accomplish especially with extreme site constraints and load limitations of the tower crane (Peurifoy et al. 2010). Nevertheless, it is still easier to control the workmanship quality of precast elements as compared with other types of structural components. Therefore, the use of precast elements is widely promoted as seen in the latest CONQUAS eighth edition where bonus points will be awarded when at least 65 % of toilets are prefabricated and if accreditated precasters are employed too. This is to reduce the need to deploy skilled manpower to carry out the finishing works, which are highly intensive on these components.

On the contrary, reinforced concrete structural system has the highest percentage of non-compliance as its workmanship quality demands more on the site conditions and skill level of the labourers which is harder to control (Meier and Wyatt 2008). Studies have found that the type of formwork and rebar chosen will affect the workmanship quality of the structural works greatly (Tattersall 1990). The two main types of rebar are mesh kind which is fixed in the factory, and the traditional method where rebars are tied manually on site. Similarly, factory-controlled mesh will be of better quality but cost is an issue (American Concrete Institute 2008). Hence, there is still a need for manual bar bending to reduce cost but its quality may not be as good as mesh rebars. Next, system formwork will ensure that a better quality finishing be achieved as compared with timber or metal formwork which tends to deteriorate faster when they are re-used to construct the next level (Oberlender and Peurifoy 2010). This is one of the reasons for a high percentage of non-compliance of the finished concrete, and Fig. 2.7 shows that the biggest source is from the exposed surface criteria where coarse aggregates and bulging are often detected due to the gaps in the formwork.

Additionally, the ultrasonic pulse velocity test for concrete uniformity has a very high percentage of non-compliance in the structural works component.

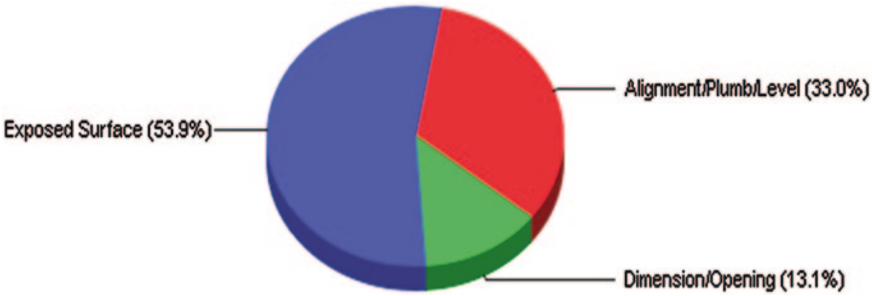

Fig. 2.7 Finished concrete—percentage defect distribution from 01/01/2000 to 30/04/2011. *Source* (Corenet 2012)

This is common in reinforced concrete structure due to the fact that continuous pour to each structural element from the same truck of the same concrete batch was not ensured due to poor estimation planning of the concrete required (ACI 2005). This is critical because if concrete of different batches are used; there will be higher chances of aggregation which compromises on the workmanship quality of the final building product.

2.5 Summary of CONQUAS Findings

To transform Singapore's building quality excellence, these common areas of non-compliance have to be eliminated. Among all three components, it is noticed that the products, systems and methods of construction chosen is critical in affecting the CONQUAS score. Moreover, the source of the major contributing factor to the high number of non-compliance actually relates to the design and materials selected. This implies that the specifications in the contract documents are influential to the contractor's effort to achieve high CONQUAS scores. Hence, in order to meet the minimum CONQUAS standards, these specifications could be drafted out based on the National Productivity and Quality Specifications which can be found electronically (eNPQS).

eNPQS aims to harmonise the industry building specifications and provide a standard platform for achieving greater efficiency and quality in the design and construction process. It is written with reference to recognised standards as well as the CONQUAS standards. This implies that having specifications drafted no less than the minimum criteria of eNPQS is an important role that the architect has to play to ensure that contractors are able to meet the CONQUAS requirements by complying with the contractual specifications (Lee et al. 2011). This also means that the contractual specifications should have incorporated the workmanship quality requirements to assure that the CONQUAS management workflow designed will at least be able to pull-off and achieve the minimum CONQUAS score. Moreover, submitting a quality control plan to the client is a criterion in the eNPQS.

Essentially, companies implementing a QMS should emphasise building quality into the product rather than inspecting quality into the finished product and removing defective products thereafter (Tan 2001).Therefore, besides the downstream quality inspection and correction activities, the upstream quality management planning activities to build quality into the product are also significant in influencing the CONQUAS score to ensure that quality is controlled as it should be and this will be presented in the next chapter.

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