Identification of issues for industry attention within Auckland building activities

May 2016

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1. Report brief from the Building Industry Federation

This report was requested by the Building Industry Federation with the intention of obtaining information to permit a focussed response to the assertion that 40 percent of building control inspections are failing. The aim of the report was to identify sources of failure in:

- Construction
- Materials (including electrical and plumbing)

The degree of failure needs to be determined with a focus on more serious issues rather than simply technical issues which can be easily addressed. Major issues are for this purpose classified as those which impact on build integrity and safety.

Construction analysis:

This should cover:

1) A systemic failure that needs to be addressed across the construction industry, including actions by RMBA, CBANZ, electrical and plumbing and non-aligned groups
2) Knowledge gaps arising through players not having access to or familiarity with the Building Code and product compliance issues
3) Problems caused by planned non-compliance and dishonesty.

Materials analysis:

This should cover identification of:

1) Products, including plumbing and electrical, not fit for purpose.
2) Generally compliant product used out of scope.
3) Specification issues.
4) Problems with product substitution.

2. Executive summary:

The good news – 40% of building inspections are not failing, the figures shows that the last three years saw an average total building inspection failure rate of 23% and an average across 2015 of 30%. The inspection failure rate peaked in August 2015 at 35% and has been in steady decline since. The bad news – there is no one key driver, rather a number of factors that when combined with a booming market have resulted in the spike.

Factors

- Improved education and skill levels of building inspectors.
- Increased building activity placing strain on all professions and trades in the industry.
- Poor understanding of the inspection process.
- Poor understanding of the compliance requirements.
- Changes in Auckland Council policy regarding status of “pending paperwork”.
- Increasing cases of substandard plans being submitted for Building Consent application.

Identified key areas for attention:

1. Educating builders on the inspection process and compliance documentation.

2. Developing of quality assurance programmes for builders as part of promoting a proactive approach to building inspections.
3. The council pushing back on designers to get the plans right before they lodge for consent.
4. Merchants and suppliers providing technical data and installation instructions on site, especially for proprietary products /systems and bracing.
5. Ensuring technical and compliance information is getting to builders on site. There are still many builders who are not members of an industry association. They are missing out on vital information. Should membership of a trade association be compulsory?
6. An area for future concern is the use of questionable products combined with a transient property developer and builder (in NZ on a short term work visa). When significant liabilities eventuate who will be held responsible?

With what information I had access to it was not possible to identify builder segments. However, in conversations with inspectors it soon became clear that there are issues across the entire builder spectrum – older builders refusing to follow new compliance requirements, younger builders taking on challenges without the skills or experience, immigrant builders not understanding the basics of the New Zealand Building Code and struggling with communications and group builders pushing site supervisors beyond their supervisory capacities. Unlike the building inspection failure rates it is not possible to verify these statements.

3. Current Situation:

Before we can review what the inspection failure rate is and its drivers it is important to understand the current environment in which the building inspectors are operating.

There are currently 117 building inspectors and the council are actively recruiting for more. Each inspector is expected to carry out approximately 9 inspections per day allowing for 45 minutes for most inspections and an hour for the framing and final inspection. Since 2013 annual inspections have grown by just under 30% with 148,000 inspections forecast for 2016.

Inspection Volumes

Year	Inspections	Annual Growth
2013	115,000	
2014	120,000	4%
2015	132,000	10%
2016 Est	148,000	12%

2016 Estimate is based on YTD growth of 12% over 2015.

With the building inspectors I spoke to there seemed a genuine desire to be customer focused and not slow down the construction process.

a. Legacy Systems:

In 2010 the Auckland Council became a unitary authority through the amalgamation of one regional council and seven territorial authorities (Rodney, North Shore, Auckland, Manukau, Papakura and Franklin). The amalgamation resulted in the building controls team operating various legacy systems across the region. This created a number of challenges:

- Unaligned processes.
- Key information not always captured.
- Unaligned definition of building, inspection & consent types.
- Industry operators working across the region challenged with inconsistent approach to consent & inspection processing.
- No one view of demand on building control resource making it difficult to allocate resource to meet demand.

Council has been working on a solution to address these challenges. Called Project NewCore it will allow the merger of all legacy systems into one SAP system.

- Implemented in two stages
    - North / West Region in October 2016
    - Central / South Region in June 2017
- All historical data merged into one source;
- Process and approach aligned across the region – this is the most significant benefit as the various legacy councils approached consenting and inspections in varying ways. The alignment of this has improved over the last few years, but NewCore is the catalyst to drive full alignment providing customers with a consistent experience across the region.
- Enables full transparency of region
- Drives significant efficiencies
    - Consent processing time
    - Inspection allocation
    - Document Handling
- Consistent customer experience
- Significant data quality & integrity gains
    - Mandatory fields
    - Naming conventions

b. Limitations of current data and analysis:

It is important to understand the current situation because it has a significant bearing on the quality and type of data available for this research. The current systems are cumbersome and time consuming to search. It took over two days to investigate 157 failed inspections over 48 building consents covering west and Central Auckland. Some of the building consent files consisted of over 90 pages of scanned hand written notes, forms and typed letters, each having to be read to find the relevant inspection comments.

It is not possible to ascertain from a failed inspection report anything other than the inspection type where the builder failed. Inspectors make no notations as to whether skill, experience or deceit is the reason for failure e.g. the builder may have failed the framing inspection because the bracing was not completed however, the report will not state if the builder did not complete the bracing because he missed it on the plans (workmanship) or ran out of time before the inspector arrived (time management)? The other point to note is there is typically more than one reason for a failure. For example: a builder failed the framing inspection because there was:

- No safety barrier installed.
- The hold downs for bracing were not done.
- The plans had not been followed.

c. Auckland Council actions:

Auckland Council is aware of increasing workmanship issues and fraudulent activity. New processes have been introduced such as:

1. Calling LBP/Architect/Engineer as part of the building consent processing to verify involvement in the project.
2. Requesting to sight LBP licences at every inspection.
3. Taking photos of both LBP licenses and any substandard workmanship that is identified as part of inspection process.
4. Laying complaints against any registered/non-registered professionals as they deem appropriate.
5. Referral of any suspected fraudulent documentation to the NZ Police.
6. Establishing quality assurance checklist training programmes for project managers and site supervisors.
7. Bi-monthly meeting with advisory group made up of builders, engineers and architects.

Auckland Council has also employed a staff member to investigate and submit complaints against registered and unregistered professionals relating to the building industry.

Complaints against registered and unregistered professionals in the last six months

	Profession	No. of Complaints
1	Engineers	11
2	LBP	43
3	PGD Board	5
4	Non- LBP	2
5	Architects	2
6	Surveyors	2

Does not include fraud investigations.

Where a building inspector has failed a builder 3 or more times on the same inspection type they are encouraged to report the builder to their team leader who in turn decides if it needs to be escalated to the Quality Assurance Auditor who can, after further investigation, lay a complaint with the LBP Registrar. It is practice that if inspectors identify a questionable (dodgy) LBP builder they will initiate a spot audit. An example given to me during an interview with inspectors was of 4 questionable LBP's working together on 36 jobs and although complaints have been made to the LBP registrar they are still currently building.

A repeated frustration voiced by a number of people at council is the time it takes for an LBP complaint to be processed, it can take 6 to 8 months to go through the process, although there is recognition that this is improving. Year on year the Auckland Council has increased the number of complaints it has laid with the registrar, this is mirrored nationally with complaints tripling in two years.

Auckland Council are also working with different industry groups. There is a current focus on reaching Asian developers and builders who don't normally attend Master or Certified builder

forums and trade breakfasts. They have started by meeting with approximately 70 Chinese developers and builders a few weeks ago where they used a local Chinese newspaper to reach them. They are also meeting tertiary learning institutions such as Unitec to show apprentices some common issues to look out for.

4. Methodology:

My understanding of the brief was to produce a report that, while not being able to stand up to statistical scrutiny, would provide a good feel of what is happening and where industry may be able to assist. The focus has been on residential construction however in some instances it has not been possible to back commercial inspections out of the mix.

My original thinking for understanding what the drivers were for the increase in failure rates was to take a random sample of building consent files that had one or more failed inspection reports, review the files and from the inspectors notes ascertain which inspection type had failed and why. After spending a couple of days reviewing failed inspections files it became evident that this method was not going to give the data required. (See Limitations of current data and analysis)

Based on the limitations of access to data and therefore analysis, I have focused on the following three areas.

1. Validating the inspection failure rate
2. Understanding the drivers for the failure rate.
3. Drilling down by inspection type.

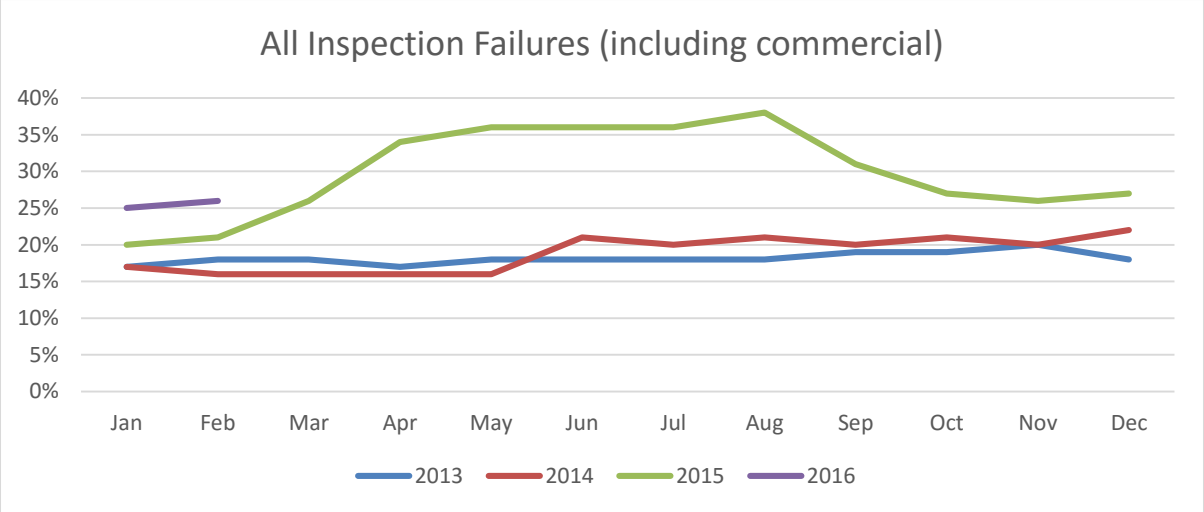
I have utilised a number of different reports as well as spending time with the Building Control team, builders and others at council and from within the industry. Although the comments are subjective they do give a good feeling and understanding of what is happening within the Auckland building market.

5. Findings:

a. Failure Rates:

When looking at inspection failure rates I have looked at the total building inspection failure rates which include commercial data and then looked at inspection failure rates excluding residential final inspection and residential final inspection separately.

In order to understand the exact inspection failure rate I have used data going back to January 2013 (the earliest I could get combined regional data). It clearly identifies a significant increase in all inspection failure rates from the beginning of 2015. The data shows the overall failure rates for building inspections is not 40%. The three year average (2013-2015) is 23%. The annual average for 2013 and 2014 is 18% and 19% respectively, jumping to an average of 30% in 2015.



Looking at the numbers from a high level the jump from 2013/14 to 2015 can be explained (but not quantified) by the following:

1. Introduction of regulation requiring building inspectors to have relevant technical qualifications.
2. Increased building activity placing pressure on current industry resources.
3. Increasing compliance demand on builders.
4. Change in council policy.

The decline since August 2015 is thought to be the result of a focused communications campaign and builders learning what is required from them in an inspection.

1. **Building (Accreditation of Building Consent Authorities) Regulation 2006, Clause 18 Requiring technical qualifications**.

Building Regulation 2006 stipulates that a building consent authority (BCA) must have a system for ensuring that all technical staff or contractors have an appropriate New Zealand qualification (or an appropriate foreign qualification recognised in New Zealand) or is working towards having an appropriate New Zealand qualification within a reasonable time. The regulation took effect in November 2013 with the introduction of workplace assessors and in June 2014 saw the first group of qualified technical staff i.e. building inspectors. Every new inspector now goes through a 6 week training school as opposed to the old system of on the job training with a 'buddy' and ad hoc training if regulations changed. The introduction of regulation 18 and therefore better training has resulted in:

- A more professional approach to onsite inspections.
- A more consistent approach across the region.

It is believed that due to improved training and education, inspectors are now more capable at identifying issues and therefore it has led to an increase in inspection failures.

2. **An increase in building activity which has resulted in:**
   - Increase workload on qualified and experienced builders supervising unqualified labourers. A common story from talking to inspectors is the group builder site supervisor looking after 20 construction sites during the 2011-12 period and now having to supervise up to 50 sites.

Visiting building sites with an inspector highlighted that some group builders were facing just as many workmanship issues as others.

- Newly qualified builders and new immigrant builders not having the experience or skill to manage construction sites.
- A four day wait for an inspection. This waiting is causing some builders to block book two to three inspections at a time. The rationale being that if they fail the first inspection they only have to wait 24 hours before the next instead of 4 days, if they pass then they cancel the additional inspections booked. Currently 12% of inspections are cancelled. This is creating administrative problems for the building control team. To counter this a cancellation fee has been proposed.

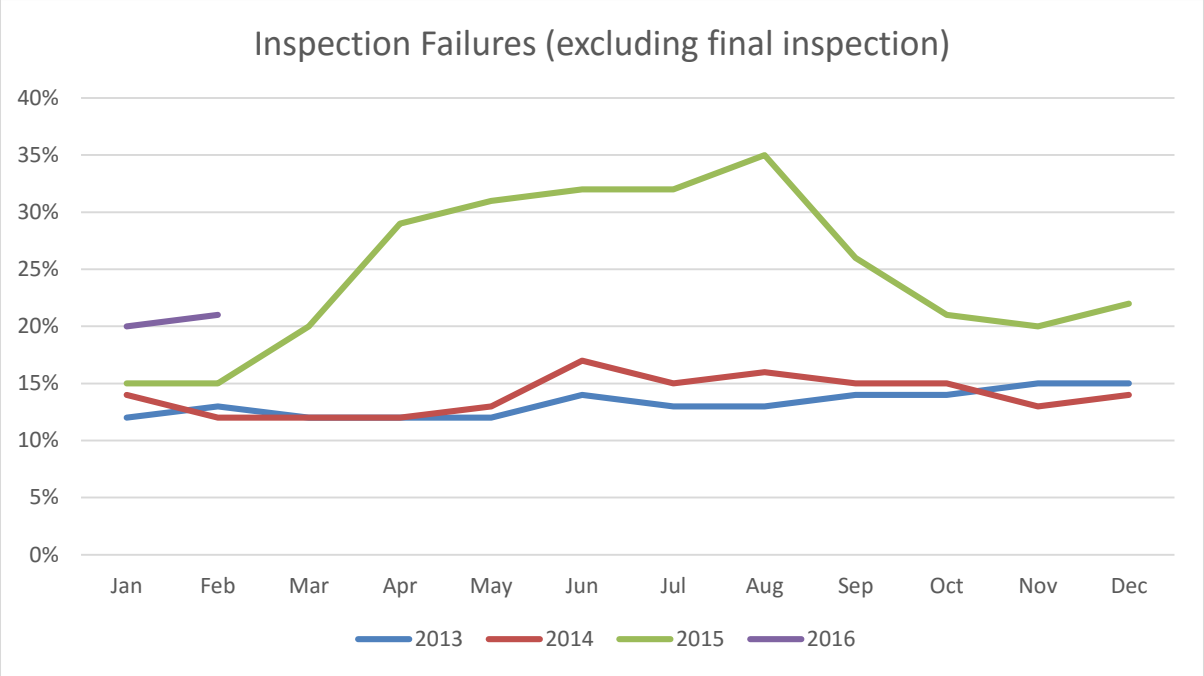
3. **Increasing compliance demands on builders** causing frustrations, delays and failures. Some builders have got up to speed quickly where others have been dragged kicking and screaming. As one older builder succinctly put it "I didn't sign up for this XXXX. Who the XXXX wants to be a builder now!". Compliance demands include:
   - Health and safety requirements on site. A number of framing inspections I reviewed had been failed and 'stop work' notices issued because of unsafe or non-existent scaffolding.
   - The requirement for builders to be able to produce their LBP licence during an inspection. After the introduction of the LBP programme there was a three year grace period before it was rigorously enforced. From 2013 the council fails an inspection if the builder cannot present their licence at the time of the inspection.
   - Requirement for minor variations and amendments for any changes to what is specified on the consented plans. (See Attachment One for an explanation of minor variation).

4. **A zero tolerance policy** which targeted high risk building work and repeat offenders, this commenced the end of 2014.

The next two charts separate out final inspections from the 'normal' inspections.

b. Failure Rates (excluding residential final inspection)

Failure Rates (excluding residential final inspection) has seen a significant jump from annual averages of 13% and 14% in 2013 and 2014 respectively to an average of 25% in 2015. The points covered previously under All Inspection Failures explain the increase and subsequent decrease from August 2015. An additional point from conversations with the inspectors, reviewing inspection report failures and talking to builders is the builder not being ready for the inspection. This appears to be a regular occurrence. Feedback from builders was the need for them to book an inspection up to a week in advance because of demand to ensure no delays on site. If they are not ready when the inspector arrives it is a fail (the builder is charged for the inspection). The builder should be cancelling the inspection, which requires 24 hours' notice, and has no charge associated with it.

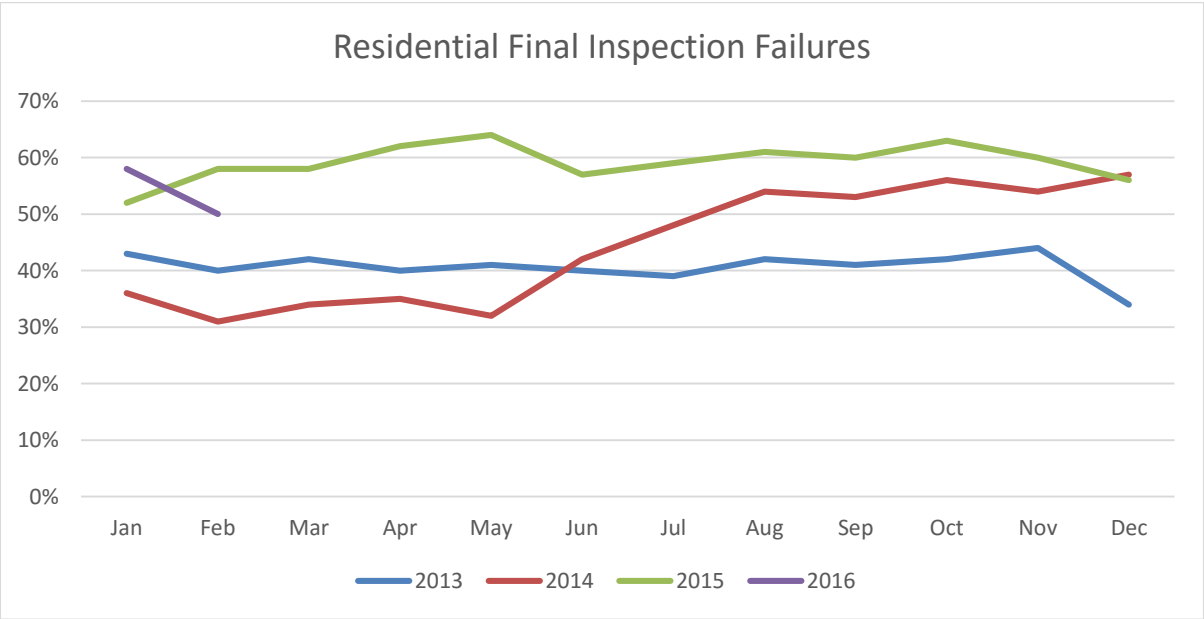


c. Residential Final inspection failures

Residential Final inspection failures, along with the framing inspection is the most challenging and time consuming of all the inspection types.

In 2013 there was an annual failure rate for final inspections of 41%, this increased to 44% in 2014 and jumped to 59% in 2015.

A key driver for the increase in failures has been the introduction of a policy regarding 'pending paperwork'. Partial pass – paper work pending has historically been recorded as a pass, it was then changed to be recorded as a failure. If the paperwork is not on site then the inspection has failed. This policy was introduced in April/May 2014. However, with the various systems in operation there has been inconsistent application of this policy across the different regions. In February 2016 the policy changed again – 'paperwork pending' is now a pass.



6. Inspection types

There are 12 inspection types that follow the residential construction process.

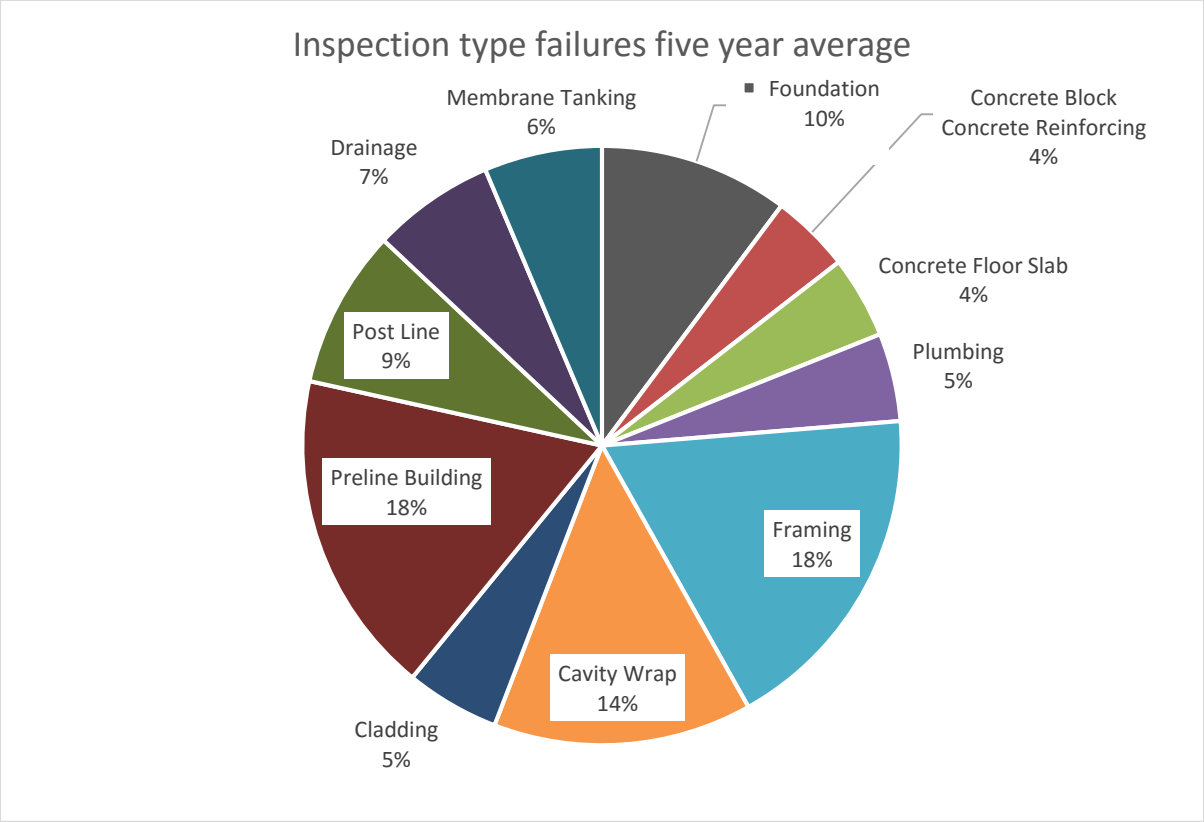
1. Foundation	7. Cladding
2. Concrete Block/ Concrete Reinforcing	8. Preline Building
3. Concrete Floor Slab	9. Post Line
4. Plumbing	10. Drainage
5. Framing	11. Membrane Tanking
6. Cavity Wrap	12. Residential Final

For each inspection type I have included a brief description of what is covered during the inspection. See Attachment Two)

Available data allows for identification of trends by inspection type failures as a percentage of total failures over the last 5 years (2016 only has two months' worth of data). Reasons for the trends has been provided through conversations with building inspectors and builders.

Historically half of the inspection type failures (when Residential Final is excluded) can be attributed to three inspection types Framing, Preline Building and Cavity Wrap.

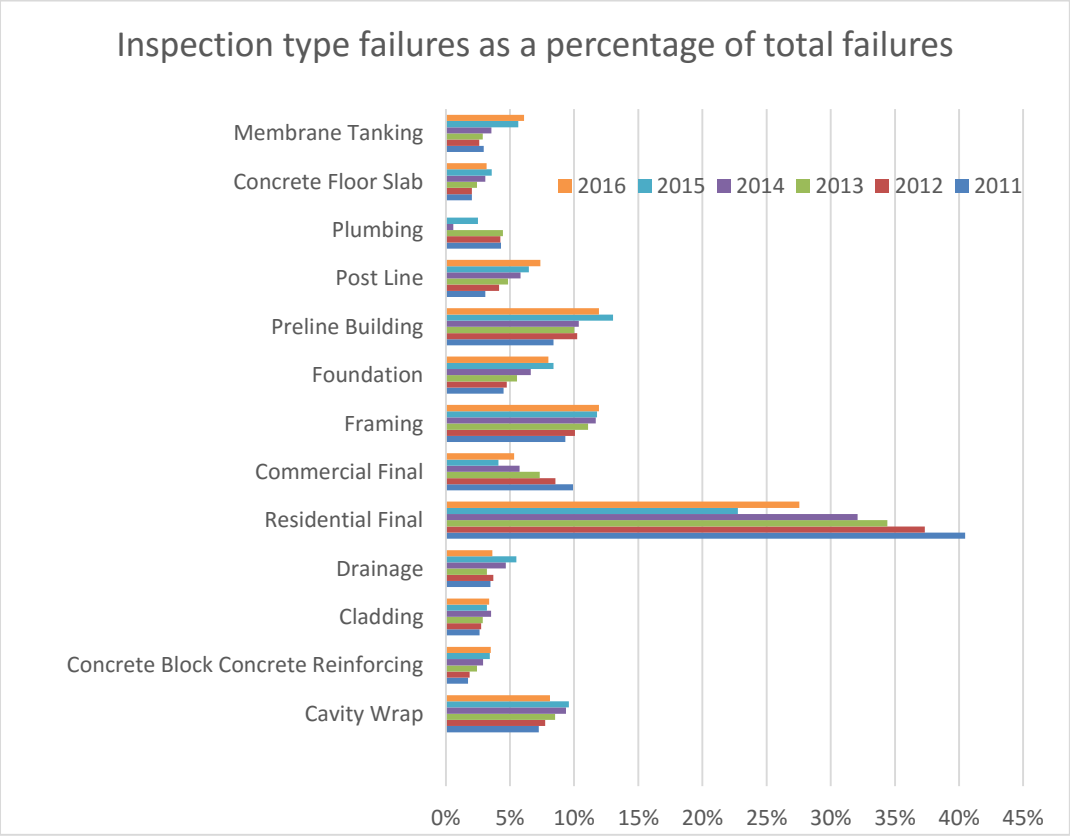
a. Inspection type failures five year average



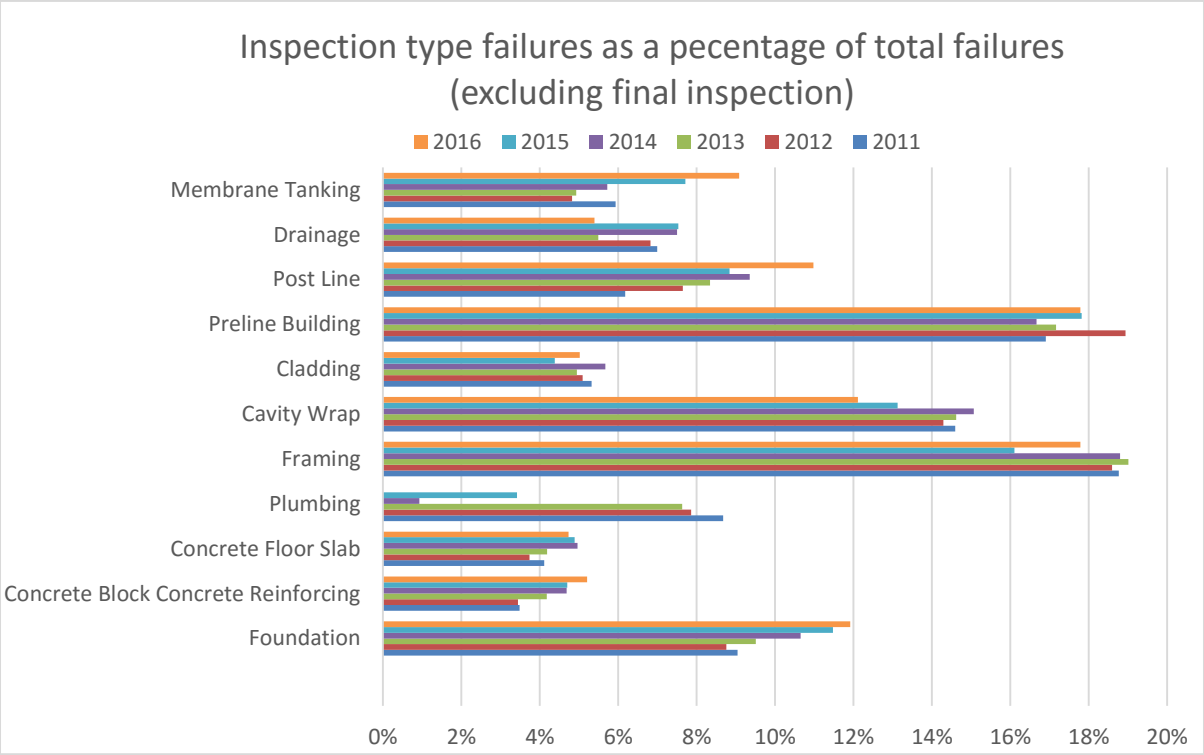
b. Inspection type failures as a percentage of total failures

The main inspection type failure is the Residential Final inspection. The good news is there appears to be a continual improvement over the last five years. It is decreasing as a percentage of total failures from 40% in 2011 to 23% in 2015. This decline could be contributed to increased vigilance throughout the previous inspections. However there are still some areas that create problems.

- Minor defects that were noted but not used to fail previous inspections must now be rectified.
- It is estimated at least 10% of final inspections fail because the site is not ready for the inspection.
- Common reasons for failure are:
    - Inadequate flashings around service penetrations.
    - Lack of hand rails and safety barriers.
    - Incorrect finish ground levels.
    - Lack of backflow prevention devices on outside taps.
    - Lack of paint on underside of bottom weatherboard.
    - No haunching on gully trap.
    - Lack of signage for non-potable water.
    - Smoke detectors on installed or installed in wrong location.
    - Ceiling insulation clearance insufficient around light fittings.
    - Undersized cesspit for size of catchment area.
    - Terminal vents not having vent cowl.



c. Inspection type failures (excluding residential final inspection)



i. Foundation /Concrete Block, Concrete Reinforcing/Concrete Floor Slab (see Framing for further comments)

The five year combined average as a percentage of total failures is 18%. All three inspection types are seeing an increase in failure rates. Feedback from inspectors as to the reasons why include:

- Inability of designers to read contour plans resulting in the builder not being able to build as per the plan.
- Site specific failures because of poor designs.
- More cut and fill happening because of higher density housing and utilisation of land on challenging sites.
- Builders not having the experience but taking on the task. This point was raised a couple of times where inspectors have observed Asian developers not using specialist sub trades but having their builders do the foundations and slabs.
- Not enough specialists available and a decrease in skill level.
- Non-compliance with minor variations and no documentation on site, especially engineer's observations.
- Common workmanship issues:
    - Steel not tied.
    - Loose debris in footings.
    - Incorrect or lack of steel placement.
    - Concrete block work not to an acceptable standard.

An example of workmanship not to an acceptable standard.

ii. Plumbing: (See Preline for further comments on plumbing)

The five year average shows plumbing accounted for 5% of the total failures. Reviews of failed inspection reports revealed very little. Reasons for failed inspections included the plumber not having a current licence (x2) and a plumber who refused to sign off the work (no reasons was given in the inspectors report as to why). Minor variation documentation or lack of it also appeared in reports. The only example found of failure attributed to workmanship was to do with the plumber not allowing sufficient fall on a mid-floor waste pipe. Only two product issues were mentioned, the failure of storm water pipes because the walls of the pipes were too thin and the use of un-verified water supply pipe. Both cases were in 2012 and both had the product replaced.

iii. Framing: (key area of concern)

This is recognised as the most difficult inspection of them all, hence why it has one of the highest failure rates and shows little sign of improving. Where previous inspections may have been given a pass despite the builder not having the required paperwork a lack of documentation for the framing inspection will result in a failure.

Builders not checking their work prior to the inspection and /or not having completed work appears to be an issue at all inspection types and particularly the framing inspection. ‘Not to plan’ was a phrase found on at least 20% of the failed framing inspection reports sited during research.

The key driver for failures with the framing inspection is workmanship. Two areas creating issues are slab layout and bracing. Although there are no figures to support how wide spread the issue is there was consensus amongst the inspectors that poor slab layout was a growing problem. Although the mistake may not be noticeable in the early stages of the build it becomes highly visible when framing is stood on site. Framing overhanging slabs is not uncommon.

Checking bracing is a key component of the framing inspection. Issues with bracing connections are common and include:

- Anchor bolts being used without washers (sold separately)
- Wind ties missed out at framing especially top plate to stud (could this be done by the prenail manufacturer?)
- Structural connections shown in engineering details but not shown on the plan therefore missed by the builder.

Poor design and workmanship

iv. Cavity Wrap (key area of concern)

Failure of the Cavity Wrap inspection is driven by three factors; design, product substitution and builder workmanship. Excluding the Residential Final inspection it accounts for 14% of the failures.

The detailing of junctions is an area of concern highlighted in inspection reports. Key points are:

- They look good on paper but impossible to build onsite
- Missing details on plans.
- Cutting and pasting inappropriate details i.e. using generic details but a proprietary product.
- Lack of knowledge or experience.
- The builder being reluctant to change details from those specified on the plans, even though he knows they are questionable, because of potential delay in construction whilst designers solves the problem.

It is estimated by a senior manager in the Building Control team that approximately 10-15% of Cavity Wrap inspection failures are caused by product substitution (especially around building wraps, membranes and claddings. The main issue with product substitution has up until recent been around the builder not having a minor variation form and / or the compliance verification documentation required by the inspector. However, in the last 12 months the council has seen an increase in the use of unverified products driven mainly by Asian developers and builders constructing spec homes. As such they have now placed greater focus on this area. (See Building Products page 17)

Although the Cavity Wrap inspection is a key area of concern, raised awareness through the weather-tightness issue has seen an improvement in Cavity Wrap inspection results. This has been a result of:

- Increased awareness across the industry (designers, builders, suppliers and inspectors).
- Better education and understanding of the risk by designers and builders.
- Better products and systems on the market.
- More proprietary products to solve issues e.g. products for penetrations and critical junctions.

v. Claddings:

This inspection does not appear to raise any major concerns. It accounts for 5% (5 year average) of the total inspection failures (excluding Residential Final). Reviewing inspection reports showed no common themes with the most serious issue being a ‘stop work’ notice placed on a site due to

unsafe scaffolding. Comments from inspectors were around the detailing and installation of flashings and builders not reading plans or the product's technical literature. (See Building Products page 17)

Did the builder really think that the inspector wouldn't notice the flashing?

vi. Preline: (key area of concern)

Next to framing this inspection has the highest rate of failure at 18% (5 year average). Reasons for failure vary from detailing and documentation, timber moisture content and minor variation documentation. However, the most common issue here is the incorrect drilling and notching of framing with the main instigators being plumbers (used to be an issue but less so now) and more recently central vacuum and heat pump installers and electricians installing smart home wiring.

Product substitution with insulation does not appear to be much of an issue as any substitution tends to be one well known product for another.

Where product substitution is an issue is with claddings. Plans may specify weatherboard using generic details and fixing instructions but end up using a proprietary system such as Jenkins A-lign without the builder realising they must use the manufacturers technical information for installation. Another common example is vertical shiplap cedar, an alternative solution that has proprietary installation requirements. Two out of the three sites that I visited fixing vertical shiplap cedar were unaware of the specific fixing requirements. Is this cladding or preline?

vii. Postline:

The vast majority of issues as, not surprisingly, to do with bracing. Workmanship issues such as the use of incorrect screws, missing bracing elements (builder not reading the plans), and incorrect fixing or administration/compliance with minor variations not being completed prior to the inspection for things such as plasterboard substitution.

With the increase in apartments and townhouses the council is seeing more failures with builder's inexperience with installing intertenancy walls. Not using acoustic sealant and incorrect fixing patterns for fire ratings appear to be the main issues.

viii. Drainage:

Similar issues to foundations:

- Designer not reading the contour plans resulting in insufficient or no fall.
- Retention tanks not being taken into consideration at design phase.
- Higher density housing meaning tighter sites.
- Lack of qualified sub-trades seeing the increase use of limited licence sub-trades.

ix. Membrane/Tanking:

An area of growing concern and council focus. Product substitution seems to be the main cause of failure. Where in the past the membrane product substitution could be addressed by the builder using a Minor Variation form it now requires a full amendment. That was the case up until last week, the council has changed the policy again due to push back from the industry.

7. Important issues:

a. Licenced Building Practitioners

Standards are perceived as not being high enough to become licenced. Inspectors are concerned about the lack of knowledge that some LBP's demonstrate.

Is a basic understanding of English a pre-requisite for becoming an LBP builder? This question was raised a number of times by inspectors and others. It is critical a builder is able to read technical literature, installation instructions, notes on plans, relevant NZ standards and the Building Code.

LBP registration is giving credibility to bad builders.

b. Builders understanding of compliance

A lack of understanding around the inspection process, required paper work and how and when minor variations and amendments are used.

If the builder has not completed the minor variation documentation (which includes a signature from the homeowner or their agent showing they are aware and have agreed to the variation) and does not have the supporting technical literature then the inspector will fail the inspection for that section. It is recorded as a fail for the total inspection however the builder can request a 'partial' inspection which for the compliant section will be recorded as a 'partial' pass.

It is common for builders not to have completed the documentation suggesting there is still confusion around the process. A number of inspectors told me that it is usually the older builders who create the issue because "they didn't have to do it in the past so why should they have to now!'

c. Building Products:

As previously stated, in the last 12 months the council has seen an increase in unverified products mainly driven by Asian developers and builders constructing spec homes. As such they have now placed greater focus on this area.

Current Building Code requires only one product to be specified on the plans. This can lead to an inspection failure if the builder makes a change during construction and has not completed the minor variation documentation prior to the inspection. Giving designers the ability to specify multiple products on the building consent would give builders options and eliminate the need to apply for minor variations. Administration processes would still be needed to record the selected product for future reference. This suggestion goes against the grain if you are a supplier and have worked hard to get your product(s) specified on the plans but may eliminate failures caused by the builder substituting "like for like" product and not completing the appropriate paperwork.

Technical installation literature either not available on site (not included with the delivery of the product) or if it is on site, not being read by the builder or labourers. Especially an issue with proprietary cladding systems.

Ability for the building inspector to identify/confirm suitability of product. This is currently a growing issue with the council coming across non-verified steel reinforcing.

Plumbing – Cheap fittings failing final inspection (inspectors unsure if products are suitable). Plumbing is on the council's radar but to date not much has been done in this area.

Insulation – not so much an issue these days, still have issue with lack of documentation for products on site.

Products currently under investigation by Auckland Council

- Asphalt shingles
- Reinforcing steel
- Safety glass
- Electrical wiring
- Cambrian slate

There is plenty of talk of cheap, not fit for purpose building and plumbing materials entering the Auckland market however I could not find one example in the 157 failed inspection reports I reviewed. All builders, and the one plumber, I spoke to preferred to source products from their building supplies merchant. Feeling amongst the trade is Asian developers are using the cheap, imported products. It is important to note that there were also stories of some group builders and fringe trade merchants importing cheap product. The issue is not the cheapness but their fitness for purpose. This is a concern for council as often these products are not well marked and impossible to trace.

d. Asian developers and builders

It is important to note that the term Asian builder encompasses a number of ethnic groups from Chinese, Korean, Vietnamese, Thai, Indian and Middle Eastern. When discussing the topic with inspectors there were a number of general observations made.

- Tend not be members of either RMBA or CBANZ.
- Tend to be fast learners but due to a high turnover rate the inspectors find that they are having to repeat themselves at each visit.
- Learn from their mistakes.
- Lack basic understanding of the Building Code.
- They are willing to make changes requested by the inspector but struggle to understand why.
- Located in clusters e.g. Avondale and Albany Heights.
- Issues generally with Asian developers using designers producing poor plans and therefore having higher rates of inspection failures.
- Poor or non-existent English skills creating communication barriers on site.
- Hard workers on site 7 days per week.

e. Quality Assurance:

Some builders are using inspection process as a quality assurance programme using the inspector to create the snags list instead of being proactive and ensuring all components of the inspection have be reviewed and sorted prior to the inspector turning up on site

Council has been working with some group builders, such as Fletcher Living and GJ Gardner Homes et al, to train their site supervisors how to do an inspection. Requires the builder to have a documented quality assurance programme.

f. Design:

The building process starts with a quality design however in an environment where resources are being pushed beyond capacity short cuts start to appear. Auckland is seeing a decrease in the level of quality of design plans being submitted for consent. Ninety five percent of building consent applications require a request for information (RFI) which results in 90% of applications being placed on hold. In an exercise to illustrate the point Jason Wang, manager inspections North/West randomly selected a set of house plans submitted for building consent, within 20 minutes he had identified 15 areas from drainage to cladding details that required further information. In the main these were basic design issues that should have been picked up by the designer prior to lodging the plans for consent. Another frustration was the amount of surplus promotional and technical information included with the consent application. Rather than provide the single required page with the technical details of the hot water system the designer had included the manufacturer's entire catalogue.

From reviewing building inspection reports from 48 sites, over a third had failed an inspection because of design issues.

8. Summary

The building inspection failure rate is not 40%. For all inspections the failure rate was 30% in 2015 and runs at a three year average (2013 to 2015) of 23%.

The increase in inspection failures can be attributed to:

1. Increased education and skill levels of building inspectors.
2. Increased building activity placing strain on resources.
    a. Not enough qualified and experienced builders and sub-trades.
    b. Site supervisors being stretched over multiple jobs and not providing adequate supervision.
3. Increased compliance demands on builders especially with product substitution and the need for minor variation documentation.
4. Changes in council policy in 2015 in recording of 'Partial pass – paperwork pending' from a pass to a fail for the residential final inspection.
5. Poor design plans being lodged for building consent.

Identified key areas for attention:

1. Educating builders on the inspection process and compliance documentation.
2. Developing of quality assurance programmes for builders as part of promoting a proactive approach to building inspections.
3. The council pushing back on designers to get the plans right before they lodge for consent.
4. Merchants and suppliers providing technical data and installation instructions on site, especially for proprietary products /systems and bracing.
5. Ensuring technical and compliance information is getting to builders on site. There are still many builders who are not members of an industry association. They are missing out on vital information. Should membership of a trade association be compulsory?
6. An area for future concern is the use of questionable products combined with a transient property developer and builder (in NZ on a short term work visa). When significant liabilities eventuate who will be held responsible?

9. Tables:

Note: 2016 includes data for January and February only.

Table 1

Inspection type failures (excluding final inspection)							
Inspection Type		2011	2012	2013	2014	2015	2016
IFO	Foundation	808	924	1108	1285	2875	126
ICB	Concrete Block Concrete Reinforcing	311	363	487	565	1177	55
ISF	Concrete Floor Slab	367	394	488	599	1224	50
IPP	Plumbing	775	829	889	112	856	0
IFG	Framing	1677	1962	2216	2269	4035	188
ICA	Cavity Wrap	1304	1508	1704	1818	3287	128
ICL	Cladding	475	537	576	684	1098	53
IPB	Preline Building	1510	1998	2001	2012	4464	188
IPL	Post Line	552	807	972	1129	2214	116
IDT	Drainage	625	720	640	905	1887	57
ITK	Membrane Tanking	530	509	574	690	1931	96
	Total Failures	8934	10551	11655	12068	25048	1057

Table 2

Inspection type failures (excluding final inspection)								
Inspection Type		2011	2012	2013	2014	2015	2016	Average
IFO	Foundation	9%	9%	10%	11%	11%	12%	10%
ICB	Concrete Block Concrete Reinforcing	3%	3%	4%	5%	5%	5%	4%
ISF	Concrete Floor Slab	4%	4%	4%	5%	5%	5%	4%
IPP	Plumbing	9%	8%	8%	1%	3%	0%	5%
IFG	Framing	19%	19%	19%	19%	16%	18%	18%
ICA	Cavity Wrap	15%	14%	15%	15%	13%	12%	14%
ICL	Cladding	5%	5%	5%	6%	4%	5%	5%
IPB	Preline Building	17%	19%	17%	17%	18%	18%	18%
IPL	Post Line	6%	8%	8%	9%	9%	11%	9%
IDT	Drainage	7%	7%	5%	7%	8%	5%	7%
ITK	Membrane Tanking	6%	5%	5%	6%	8%	9%	6%
		100%	100%	100%	100%	100%	100%	100%

Table 3

Inspection type failures							
Inspection Type		2011	2012	2013	2014	2015	2016
ICA	Cavity Wrap	1304	1508	1704	1818	3287	128
ICB	Concrete Block Concrete Reinforcing	311	363	487	565	1177	55
ICL	Cladding	475	537	576	684	1098	53
IDT	Drainage	625	720	640	905	1887	57
IF1	Residential Final	7287	7278	6885	6226	7801	434
IF2	Commercial Final	1786	1665	1462	1113	1406	84
IFG	Framing	1677	1962	2216	2269	4035	188
IFO	Foundation	808	924	1108	1285	2875	126
IPB	Preline Building	1510	1998	2001	2012	4464	188
IPL	Post Line	552	807	972	1129	2214	116
IPP	Plumbing	775	829	889	112	856	0
ISF	Concrete Floor Slab	367	394	488	599	1224	50
ITK	Membrane Tanking	530	509	574	690	1931	96
	Total Failures	18007	19494	20002	19407	34255	1575

Table 4

Inspection type failures							
Inspection Type		2011	2012	2013	2014	2015	2016
ICA	Cavity Wrap	7%	8%	9%	9%	10%	8%
ICB	Concrete Block Concrete Reinforcing	2%	2%	2%	3%	3%	3%
ICL	Cladding	3%	3%	3%	4%	3%	3%
IDT	Drainage	3%	4%	3%	5%	6%	4%
IF1	Residential Final	40%	37%	34%	32%	23%	28%
IF2	Commercial Final	10%	9%	7%	6%	4%	5%
IFG	Framing	9%	10%	11%	12%	12%	12%
IFO	Foundation	4%	5%	6%	7%	8%	8%
IPB	Preline Building	8%	10%	10%	10%	13%	12%
IPL	Post Line	3%	4%	5%	6%	6%	7%
IPP	Plumbing	4%	4%	4%	1%	2%	0%
ISF	Concrete Floor Slab	2%	2%	2%	3%	4%	3%
ITK	Membrane Tanking	3%	3%	3%	4%	6%	6%
		100%	100%	100%	100%	100%	100%

10.

a. Attachment One:

Explanation of Minor Variations

All proposed minor variations need to be communicated to the council before the building work is undertaken. Decisions about whether a change meets the definition of a minor variation and whether the minor variation can be granted are the responsibility of the building inspector, not any other party. Following receipt of a minor variation proposal the inspector should advise the applicant whether the change will be assessed as a minor variation or is too significant a change from the consented building work and requires a formal application for an amendment to the building consent.

Regulation 3 of the Building (Minor Variations) Regulations 2009 defines a minor variation as follows:

Minor variation defined

(1) A minor variation is a minor modification, addition, or variation to a building consent that does not deviate significantly from the plans and specifications to which the building consent relates.

(2) The following are examples of minor variations and do not constitute an exhaustive list:

(a) substituting comparable products (for example, substituting one internal lining for a similar internal lining)
(b) minor wall bracing changes
(c) a minor construction change (for example, changing the framing method used around a window)
(d) changing a room's layout (for example, changing the position of fixtures in a bathroom or kitchen)

(3) The examples in sub-clause (2) are only illustrative of sub clause (1) and do not limit it. If an example conflicts with sub clause (1), sub clause (1) prevails.

(4) To avoid doubt, a minor variation does not include any building work* in respect of which compliance with the building code is not required by the Building Act 2004.

*Building work defined under 3 (4) above is any type of work associated with the construction of a building that does not need to comply with the Building Code. This is not the same type of building work as defined under section 7 of the Act.

b. Attachment Two:

Inspection Type Definitions

Inspection type	Task	Description
IFO Foundation	Siting	Boundaries defined/survey pegs/string lines.
	Piling	Depth of piles and soil conditions/where driven piles or drain bridging is used a registered engineers PS4 is required.
	Excavation	Depth of excavation relating to datum's are clearly identified and proximity of other buildings and protection measures in place.
	Foundations/Reinforcing	When all reinforcing is in place and tied prior to the placement of concrete.
	Retaining wall systems other than block or concrete	Pole hole size and depths, footing designs, poles in place.
ICB Concrete Block Concrete Reinforcing	Concrete block reinforcing walls, and retaining walls	All reinforcing placed and tied; all cells to be clean; washouts to be open for viewing: tanking in place; drain in place in applicable.
	Column and beam reinforcing	All reinforcing tied, stirrups at appropriate centres, reinforcing laps appropriate, spacers in place to achieve clearances from formwork.
	Precast fixings	Brackets, bolts, washers and inserts in place.
ISF Concrete Floor Slab	Subgrade before hardfill	Soil conditions for standard and raft floors PS4 required for cut and fill compaction.
	Siting	Boundaries defined/survey pegs/string lines for raft slabs.
	Floor slab/DPM	Hard fill compacted, DPM placed and reinforcement tied in place with chairs and starter bars fitted.
	Tilt slab reinforcing	Formwork constructed, reinforcing in place, tied and barchairs provided, lap bars in place, fixings located.
IFG Framing	Subfloor Framing Subfloor Bracing	Foundation bracing, piles, connections, brackets, fastenings, beams, floor-framing members, floor insulation all in place.
	Wall / roof framing	Hold down straps, bolts, wall and roof framing members, bracing, tie downs. Timber treatment and truss layout certificates required. Beams and lintels. Plywood substrates for membranes including falls and outlets.
	Pre-wrap & Pre-cladding	Required when straps, steel bracing, connecting plates etc to be in place.
	Skillion roof	Prior to roof covering. Includes insulation and fixings.
ICA Cavity Wrap	Wrap	Wrap fixed, tapes, flashing around all penetrations, sealants, prior to cladding, or backing being installed. Control joint flashings. Apron flashings, Head & sill flashings installed.
	Cavity	When structure has been constructed, battens in place, cavity closers with flashings and cavity has been formed.
ICL Cladding	Stucco 3-coat 'Cavity system only permitted' 2-coat only permitted over masonry or brick.	1. Inspection of all rigid backings (RAB) for fixings and flashings. 2. Flashing around all penetrations plus sealants, prior to rigid or non rigid backing being installed. 3. Mesh fix prior to application of plaster 4. Inspection of second plaster coat, control joints fixed in place, before applying final coat of plaster. 5. More inspections required where isolated elevations are being plastered.
	Brick veneer	1/2 height inspection. (Both floors for two storey). Lintel bar and shelf angle fixings. Slip joints.

Inspection type	Task	Description
ICL	Cladding inspection	When cladding has been fixed in place. Includes Polystyrene backing fixings, reinforcing tapes, plaster coating. Monolithic boards, and proprietary systems. Control joints.
	Cladding non cavity	All scribers and flashings to be in place, seals around waste pipes.
**IPB Preline Building	Preline building	When building is closed in and weathertight and prior to fixing of internal linings, proprietary connections to building elements installed moisture contents below 18%.
	Insulation	Insulation installed in all walls and ceiling. Thermal and acoustic.
IPP Plumbing	Preline plumbing	Pipe work is under test (Water supply and soil wastes). (This may be included with the preline building inspection.)
	Under slab Plumbing	All under slab drainage and plumbing to be under test. All open for inspection.
IPL Postline	Post line	All bracing elements nailed prior to cover up by architraves, skirtings or cornices. Includes diaphragm ceilings.
IFR Fire Rated Linings	Fire rated linings and smoke stop	Prior to cover up by other materials, coatings, incl. suspended ceilings. Includes collars warps and other devices.
ITK Membrane Tanking	Membranes, decks/ showers/ walls	Prior to cover up by wall cladding and floor cladding.
	Tanking, and sub-soil drains behind walls	Tanking of the block work/ concrete retaining wall and the laying of the sub-soil drain prior to back filling.
*IDT Drainage	Drainage	Under test, air or water prior to backfill of trenches. Asbuilt complete.
	Sewer connection	Prior to backfill and inspection cover being in place plastering of connection completed where new connection into access chamber.
	Eco effluent disposal system	Prior to cover up of effluent disposal field.
IF1 Residential Final	Final inspection	All work completed including landscaping.
IF2 Commercial Final	Means of escape	Emergency lighting, door furniture, alarms in place.
	Final inspection	All work completed including landscaping.
IFP Solid Fuel Appliance	Fire place	Flue and fire box clearances checked prior to cover up. Hearth to be in place.

c. Attachment Three: Inspection order for residential