

THE CONDOMINIUM PROCESS AND NOISE

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1 Introduction

In our practice, we frequently provide acoustical engineering services to condominium developers and other builders of multi-unit residential construction. Some are large local firms, others are small with limited experience.

In all cases, we find that it helps to break down the project process into individual steps and activities, with clear identification as to who is responsible for what. All participants, including the owner (or future owner) down to the General Contractor's labourer who watches over the site, have a role to play.

This paper presents a flow chart and description of the process we use: Project Definition; Concept Design; Detail Design; Tender and Construction; Commissioning; and Final Reporting. In Ontario, we have the Tarion Home Warranty Program [1] which superimposes accountability standards and reporting requirements for some types of projects.

This process can be applied to large and small projects, high end developments to social housing, as well as wood, steel or concrete construction.

2 Project process

2.1 Project definition

This step establishes Design Parameters consistent with client expectations and costs.

New clients typically do not have a clear understanding of acoustic design criteria, describing their expectations as “sound-proof”, “inaudible”, and other terms that are neither realistic nor affordable. We start our projects with the preparation of an Acoustic Design Brief which articulates all acoustical performance criteria in clear and measurable terms. These include those listed in the Building Code (STC and IIC), as well as a host of other criteria, including:

- Control of environmental noise (traffic and stationary sources as applicable) as is regulated by the Municipality [2] based on authority delegated by the Province [3].
- Base-building external noise emissions (to ensure compliance with the City of Ottawa Noise Bylaw [4]) and self-noise objectives for outdoor spaces, sources including A/C condenser units, heat pumps, exhaust fans and more.
- Noise within the units due to HVAC equipment within the unit (compliant with the Guidelines published by ASHRAE [5]), including noise from exhaust fans in kitchens, washrooms, dryer exhausts,

and hot tubs/whirlpools.

- Control of noise from special issues such as garage door openers or garbage room roll-up doors.
- Vibration isolation of the base-building machinery and equipment (pumps, air handling units, cooling equipment, etc.).

Working with the Developer and Architects, initial cost-estimates can be developed (“Class D” [6]). As the Developer learns more about the cost implications of what is being asked for, the above design criteria can be modified.

2.2 Concept design

Early in the design process, it is required to submit an Application for Site Plan Control to the municipal authorities for review and approval. While only a plan drawing at grade, it is required to define the planned buildings in enough detail that the application can be fully understood: building footprints and number of floors.

Once the concept designs have been developed to a point suitable for review, these can be subjected to cost-estimates offering a higher level of precision and thus a better degree of confidence (“Class C”).

2.3 Detail design

Once a concept design has been identified as the preferred option, this can then be matured to a complete design, suitable for tender and construction. Sometimes this is broken down into several sub-parts, but often, especially with a mature design team and motivation to work fast, a “one-pass” approach is adopted.

Our contributions to this phase include providing input to the Architect as needed for any unique conditions, and provision of a set of Acoustical Notes. If the project includes a set of specifications, we provide input to these. Often these will be in NMS [7] format but not always.

The detail design, once completed, allows for the further refinement of cost estimates (“Class B”). Should any excesses over budget be identified, there may still be time to revise the original design criteria, before any money actually gets spent.

In the context of for-profit housing, at some point during the above process, the product needs to be presented in the marketplace so that purchasers can make deposits and target move-in dates. Once this milestone has been reached, it becomes much more difficult to change the detail design, as once commitments have been made, it is difficult-to-impossible to revise them without engendering dissatisfaction.

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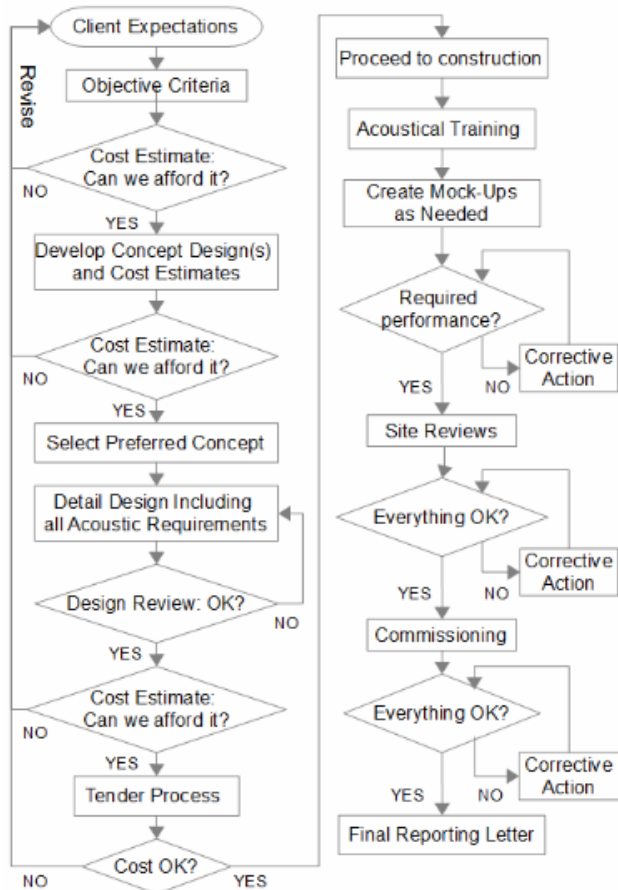


Figure 1: Flow chart of the condominium process

2.4 Tender and construction

For new clients/projects, we offer acoustical training for the Site Supervisor(s) and sub-trades. This takes roughly an hour, and secures names and signatures from each of the key contractors working on the project. We've found this very effective for reducing the incidence of construction issues later, and at the very least, it increases accountability should any issues arise.

During construction we undertake site reviews of the work-in-progress, visiting the site at least for the following milestones: post-demolition (if the project is the conversion of an existing building), so as to identify any hidden details requiring a Site Instruction; post completion of the framing, early in the prep-work phase, well before anything gets covered over; when mechanical and electrical rough-ins are progressing; key wall junctions as they are developing and completed; and installation of the floating floors (if applicable).

Of note, while this paper has presented the above process from the perspective of design and construction of for-profit condominiums, on a practical level, we adopt the same approach for our non-profit, affordable housing projects as well. For these projects, we are typically asked to spend additional time on value engineering during the design process, to identify cost-savings.

2.5 Commissioning

For the construction of new condominiums, we are required to follow the requirements of Tarion Builder Bulletin 19R. This includes testing of the final noise isolation performance of a sample of units. We do this following the requirements of ASTM E336 [8] and E1007 [9].

Depending on the project, our commissioning can extend to verification of noise levels due to HVAC and other equipment, both internal and external to the building.

Should any issues arise, these can then be addressed. However, we emphasize to our clients that commissioning is not the best time to identify and fix weaknesses, but rather, the process outlined above is intended to avoid issues at commissioning and beyond.

Depending on the project, sometimes we do very little testing to verify that the intended field performance has been achieved. It is the threat of testing that keeps the trades on task, combined with frequent site reviews.

2.6 Final reporting

We usually end our projects with a short reporting letter outlining our key activities, and then attaching a sample of the results of our testing (essential for projects subject to the requirements of Tarion Builder Bulletin 19R).

References

- [1] Tarion Builder Bulletin 19R, published December 2016, effective in January 2017.
- [2] City of Ottawa Environmental Noise Control Guidelines (ENCG), 2016.
- [3] Ontario Ministry of the Environment NPC-300 published August 2013.
- [4] City of Ottawa Noise Bylaw, 2017 review.
- [5] ASHRAE HVAC Applications Handbook Chapter 48, 2015.
- [6] Cost-estimate Classes as defined by PWGSC: <https://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/bi-rp/conn-know/couts-cost/definition-eng.html>
- [7] National Master Specification (NMS) from PWGSC.
- [8] ASTM E-336 Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings (current revision).
- [9] ASTM E-1007 Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures (current revision).