

# **Guidelines for Effective Institutional Piano Maintenance**

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## **What is the Piano Technicians Guild?**

The Piano Technicians Guild (PTG) is a nonprofit, international organization of piano technicians. The mission of PTG is to promote the highest possible standards of piano service by providing members with opportunities for professional development, by recognizing technical competence through examinations and by advancing the interests of its members.

Membership is open to all individuals with a professional or avocational interest in piano technology.

A Registered Piano Technician (RPT) member has passed three rigorous examinations that assess the knowledge and skills required to tune, maintain, and repair pianos.

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## Foreword to the 1990 edition

There are some 1,400 schools of music or music departments in institutions of higher education in North America. Virtually all of them have inventories of pianos, ranging from a few to 500 instruments, as crucial components of their academic activities. These institutional piano inventories are maintained by professional piano technicians who, more often than not, work in relative isolation from one another.

The Piano Technicians Guild (the professional association for piano technicians), through its College and University Technicians (CAUT) Committee, endeavors to ameliorate this condition of isolation. The Committee has established a communication network comprising some four hundred piano technicians in higher education with hopes that their collective expertise may be brought to bear on problems common to their institutional situations.

The Committee held an open forum involving 50 college and university technicians at PTG's July 1987 Convention in Toronto. There, and at a similar meeting of 88 professionals at the July 1988 Convention in St. Louis, the single most pressing issue to emerge was the need for a guiding statement on standards for institutional piano maintenance. The present document is the result of the Committee's formally accepting the challenge of providing such a statement.

Lou Tasciotti, the project's principal developer, presented successive drafts of these *Guidelines* to no fewer than 120 colleagues during the course of their evolution. Their critical input gives this monograph much broader significance than it would have had otherwise. It is the Committee's hope that piano technicians as well as administrators of departments and schools of music will find these *Guidelines* useful in efficiently directing their resources for the advancement of musical art.

*Thomas McNeil*  
*Fredonia, New York*  
*May 30, 1990*

## Foreword to the 2004 edition

In 2000, ten years after the *Guidelines for Effective Institutional Piano Maintenance* was first published, a review of the document was initiated by CAUT Committee Chair Don McKechnie. Preliminary discussion identified two areas where major changes were needed.

First, a need was seen for material addressing the specific needs of smaller institutions, and of programs that obtain piano service through contracts, since the original document focused mostly on the concerns of larger institutions with full time employees. The second area of concern was the Workload Formula, intended to produce a recommended workload or staffing level in keeping with the specific conditions at individual institutions. Many technicians found that while the formula worked in many instances, in others the recommendations produced by this formula were unrealistic and did not address a variety of institutional situations adequately.

Over a period of two years, revisions were undertaken in these two areas, along with smaller editorial changes elsewhere in the document. In the midst of this editorial activity, the CAUT Committee, again at the initiative of Don McKechnie, undertook to organize a "Symposium on the Piano in Academia," which took place in Chicago in 2002. At this event, music faculty and administrators met with technicians and manufacturers to share concerns and ideas. The Symposium made clear the need for continuing efforts to communicate and educate one another in areas of mutual interest and concern.

It is our hope that this newly revised *Guidelines* document will help us move further in that direction. As this foreword is being written, plans are underway to produce additional supplementary materials focused specifically on the needs of small institutions and to develop educational initiatives aimed at improving the level of skill of college and university technicians across the country.

*Fred Sturm*  
*Albuquerque, New Mexico*  
*December 3, 2002*

# Introduction

Pianos represent the foundation of the musical learning process and are viewed as the “basic” musical instrument. Most areas of musical instruction require the use of the piano, whether for conducting, vocal coaching, ear training, or actual piano performance. As a result of this universal need, the quality of pianos and their condition is of great importance and effective institutional piano maintenance benefits faculty and students in all musical disciplines.

The purpose of this document is to serve as a guideline for effective piano maintenance in schools of music and music departments at the college and university level. The inventories of such institutions often represent a large investment in high-quality instruments. The challenge of piano service in the institutional setting lies in maintaining the excellence of these inventories in order to meet the artistic demands of faculty and students.

The College and University Technicians (CAUT) Committee of the Piano Technicians Guild (PTG) wishes to address this challenge. Factors to consider concerning institutional piano maintenance include the following:

1. Artistic needs demand high-quality instruments in top condition. Meeting this demand requires a high level of skill and a continual investment of time on the part of the piano technician.
2. Pianos that are not maintained to a suitable standard interfere with instruction, performance, and the learning process.
3. Many institutional pianos receive extended hours of use, often eight to twelve hours daily. This leads to rapid wear and the need for an accelerated schedule of parts rehabilitation and replacement.
4. Pianos are shared. Lack of individual ownership often leads to neglect and abuse.
5. Understaffing of piano maintenance programs, together with lack of consistent and adequate replacement budgets, leads to premature deterioration of piano inventories.
6. The physical environment at most institutions is unsuitable for pianos. Modern HVAC systems, designed for rapid exchange of air, produce constant air movement. This, coupled with lack of humidity control, leads to drastic tuning instability (far greater than that observed in private homes) as well as premature deterioration of wooden components (particularly soundboards and pinblocks).

One of the primary goals of this document is to establish a standard by which institutions may determine how many piano technicians are required to meet their needs. For performance-oriented conservatories and music schools CAUT recommends a ratio of one full-time technician for every forty to sixty pianos. For typical non-performance institutions, a ratio of one full-time technician for every sixty to eighty pianos is recommended. For general education music departments in institutions where music is not particularly emphasized, a ratio of one full time technician per hundred pianos may be adequate.

These recommendations are based on empirical information gathered by the CAUT Committee from piano manufacturers, piano technicians, and music institutions. Because they are general recommendations, and because no two institutions are identical in their piano maintenance needs, we have developed a Workload Formula to help administrators and technicians determine the relationship between the staffing needs and the piano inventory of their individual institutions (see *Appendix*, page 15).

The CAUT Committee does not presume to prescribe the structure of administrative responsibility at music institutions and conservatories. However, we strongly recommend that technical staff be included in administrative decision making relevant to piano maintenance. This should include consultation in decisions regarding piano purchases, the vending of rebuilding and remanufacturing contracts, and the design process for major facilities renovation particularly with regard to HVAC/humidity control.

New pianos are continually needed in most institutions. The purchase of new pianos may appear to be a more tangible expenditure and is often easier to present in the budgeting process, but effective maintenance is also a vital part of an institution’s piano investment.

There are differences between the more complicated needs of large institutions and those of smaller music departments. This document in many instances contains separate recommendations for the two situations. With either type of school, specific needs are best addressed in consultation with the school’s staff or contract piano technicians.



# General Recommendations

## I. Lead Technician

While this document uses the term “lead technician,” title structures vary greatly throughout academia. Terms like “supervising technician,” “head technician,” “managing technician,” etc. are also used. Regardless of which term is used, the title and job description for the primary piano technician should reflect a position that requires a person of highly developed technical and managerial skills.

Any institutional piano maintenance program, whether staffed by contractual or regular employees, should be headed by a lead piano technician with adequate qualifications and experience (see *Minimum Qualifications and Training*, page 5). If there is a lack of experienced technicians in the region, the CAUT Committee recommends that the school work to develop the skills of local piano service personnel. Contact PTG for help in finding and developing qualified technicians.

The lead technician should be granted sufficient authority and responsibility to :

- A. Oversee the work of additional technicians.
- B. Oversee vending of contracted rebuilding.
- C. Have close involvement in all decisions regarding piano purchases, loans, leases, and replacement.
- D. Create and implement a long term piano maintenance plan.

If not performing all the piano work at the institution, the lead technician should typically take responsibility for performance and other critical-use pianos and oversee work on the less critical inventory.

In some circumstances, a contract for piano service is made with a business entity such as a piano retailer instead of directly with a piano technician. If so, the contractor should identify a lead piano technician to oversee the piano service program. It also may be appropriate to hire an external consulting technician from time to time to avoid issues of conflict of interest and other potential problems.

## II. Long-Term Planning

A long term plan is essential to the success of any piano maintenance program. The plan should include:

- A. A strategy for ongoing replacement of instruments.
- B. A schedule for regular major rebuilding, whether in house or contracted out.
- C. A plan for ongoing maintenance of the inventory at a standard according to need.

The workload formula (see *Appendix*, page 15) will be useful in establishing an appropriate staffing level. A long-term plan, along with an associated budget, should be developed with the assistance and participation of the institution’s lead piano technician and/or consulting technician. The plan should project a horizon of about twenty years.

In cases where the piano inventory is in a deteriorated condition, it may be necessary to establish a short-term plan (over perhaps a five-year period) to address the need for an accelerated replacement and rebuilding program. This would bring the inventory to an initial acceptable standard which the long-term plan can maintain.

The workload formula again may be useful in establishing a temporary increased level of staffing. A major purchase of new pianos will also require a temporary increased level of staffing to deal with the additional service needs during the break-in period.

### **III. Budget Considerations**

It is critical that piano replacement, rebuilding, and maintenance be built into the overall budget structure of an institution at a fundamental level. It makes sense to treat pianos as a capital expense both as an initial purchase and from the point of view of ongoing maintenance and upkeep. This is justified by their relative longevity (pianos often last longer than buildings) and by the fundamental role they perform in higher education music programs.

# Staffing and Workload

The CAUT Committee recommends a ratio of one full-time technician for every forty to sixty pianos in performance-oriented institutions. For typical non-performance institutions, a ratio of one full-time technician for every sixty to one hundred pianos is recommended. Many smaller schools may not have a large enough music program to justify a staff position for a piano technician. This document should provide a basis to establish a viable contract program in the smaller school.

The following outline and description of some general standards for piano maintenance required in institutional settings provide further information related to the ratios listed above.

## **I. Concert Tuning and Preparation**

Concert pianos should be tuned the day of each concert. In addition, extra time must be available for concert preparation including regular voicing and regulation.

## **II. General Tuning**

All pianos should be tuned a minimum of four times a year. This recommendation addresses moderate seasonal changes in temperature and humidity that cause pianos to go out of tune. Severe seasonal changes in humidity and/or short term humidity instability will increase tuning needs while pianos in stable or controlled environments may require fewer annual tunings. Pianos with heavy and/or critical use will require more frequent tunings. In addition, an effective program must be able to accommodate tunings for specific events (other than concerts) such as master classes and auditions, and special-use pianos assigned to piano faculty.

## **III. Miscellaneous Repairs**

Time must be included to perform routine and emergency repairs on a daily basis. These repairs may include broken strings or keys, action malfunctions, removing foreign objects which have fallen into pianos, and a host of other minor complaints associated with heavy use.

## **IV. Reconditioning (General Maintenance for Wear and Tear)**

In order to maintain pianos in excellent condition, parts need to be rehabilitated and adjusted on a continuing basis. Tasks include hammer filing, action regulation, voicing, action pinning, and key re-bushing. Minor reconditioning is recommended on an annual basis for pianos in high-use situations in order to counter the effects of wear and seasonal changes. Less frequently, major reconditioning, which may include replacement of some parts, will be required. Pianos must be in good overall condition for this type of maintenance to be effective.

## **V. Rebuilding**

In order to extend the useful lifetime of pianos, a regular program of partial and/or complete rebuilding is necessary. Rebuilding procedures enable an institution to get the maximum benefit from its investment in high quality instruments by maintaining them in “like new” condition for as long as possible. While it is impossible to give a general recommendation on rebuilding, it can be noted that institutional pianos usually receive five to ten times as much use as non-institutional pianos and may require some form of rebuilding in as little as five years.

The ability to do some form of rebuilding should be within the scope of a piano maintenance program. Complete rebuilding may require contracting to the manufacturer or a specialty shop with a proven track record that meets or exceeds the manufacturer's specifications. At a minimum, a piano maintenance department should have the capability to do complete action rebuilding.

#### **A. Complete Rebuilding**

Complete rebuilding is a process by which a piano can, for all intents and purposes, be restored to its original, like-new condition. This includes the replacement of all major components of the instrument such as the soundboard, pin block, strings, tuning pins, bridges, hammers, and action parts, as well as case refinishing.

#### **B. Partial Rebuilding**

Partial rebuilding usually addresses areas that fall short of replacing the soundboard and bridges. It may include restringing with oversize tuning pins, new action parts, new key coverings, recapping bridges, soundboard crack repair, or any other operation which does not replace or alter any structural components of the piano.

### **VI. Miscellaneous**

In considering the full scope of an effective piano maintenance program, the following areas of responsibility must be taken into account:

#### **A. Staff Supervision**

Where there are multiple employees, the job of a lead technician includes developing roles for a staff with varying degrees of expertise, coordinating projects, defining procedures, and monitoring quality control. In addition, some training of assistants may be required especially in situations where work-study students are employed for less skilled tasks.

#### **B. Paperwork**

This includes inventory management, parts ordering, correspondence, reports, research, work procedures, scheduling, and faculty communications.

#### **C. Teaching**

Many piano technicians in music institutions teach courses in piano technology that may include the history of the piano, theory of tuning and historical temperaments, practical information on selection and maintenance, and possibly introductory technical classes.

#### **D. Maintenance of Other Keyboard Instruments**

Some piano technicians possess special skills required for maintenance of harpsichords, organs, fortepianos, clavichords, or electronic keyboard labs. Many schools rely upon their expertise due to lack of additional special staff.

## **VII. The Contract Technician**

Since the majority of college and university technicians are independent contractors, especially in mid-size and smaller schools, it is important to address the unique requirements of the contract technician position. The contract technician often is expected to perform in ways a staff technician performs, but usually pays out of his or her own pocket for benefits, billing and estimating time, phone work, organizational and planning time, and professional development.

In contract situations it is particularly important to define to whom the contract technician reports, to arrange for scheduling and access to buildings and rooms, to ensure consultation in purchase and rebuilding contracting, and to define relationships with other technicians in the same institution.

Universities and colleges often use a bidding process to keep the piano maintenance budget as low as possible. The lowest bidder may be under-qualified and lack the specialized knowledge needed for college and university piano service. Adequate qualifications and experience are essential in selecting a contract piano technician and should be clearly defined in the request for bids.

Hiring a highly qualified contractor may seem prohibitively expensive in the short term, but long-term savings may be realized through more efficient use of resources. For example, rebuilding may often be a less expensive alternative to replacement, and a skilled and experienced technician can prolong the useful life of a piano many-fold. An underqualified technician may produce unacceptable results that could accelerate the process of deterioration and shorten the useful life of the piano.

## **VIII. Minimum Qualifications and Training**

The CAUT Committee recommends that the minimum qualification for a college and university technician be Registered Piano Technician (RPT) standing in the PTG. Although there are competent piano technicians without this standing, the RPT classification is the only recognized affirmation of professional standing for the piano technician in North America and is highly regarded throughout the world. The skills tested in order to achieve this classification are basic to professional piano service.

In addition, college and university technicians require specialized knowledge that is not covered in the RPT testing. They should have advanced skills in concert piano preparation, regulation, and voicing. They should be comfortable with the advanced tuning level required for the recital and concert stage, as well as the techniques required for the more time-efficient tuning work performed in the practice room. While these individuals may or may not perform advanced rebuilding themselves, they should have a working knowledge of action and structural rebuilding in order to properly advise administrators regarding contract vending.

A number of schools offer basic level training in piano technology, but additional training is needed to attain the advanced level of knowledge and skills required for academic institutions. Specialized skills and training may be obtained through informal apprenticeships with highly qualified technicians; through PTG events such as the annual convention, regional seminars, state seminars, and CAUT Committee-sponsored events; and through manufacturer training programs.



# Budgets

Pianos are arguably the most important educational tools needed in a music school or department. Purchase and replacement of pianos requires a large initial and continuing capital outlay. A proportional maintenance budget is essential to ensure that the institution gets the maximum benefit from its investment. An adequate piano maintenance budget will generally be between five and ten percent of the replacement cost of the piano inventory. This includes staff, parts and supplies, and the purchase of new pianos. There should be some flexibility in the use of the annual budget so that the piano technician has the ability to allocate funds between rebuilding, contract tuning, equipment needs, etc. as needed.

Since budgets for smaller schools with only contract technicians will differ from budgets for larger programs with employed technicians and shop facilities, these situations will be considered separately.

## I. Budgeting for the Larger Program

In addition to staffing, consideration must be given to the following budgetary items:

### A. Parts Inventory

A properly equipped piano maintenance shop should have an inventory of replacement and repair parts appropriate to the size of the piano inventory. In anticipation of the almost daily mechanical failures expected in institutions, an adequate parts inventory will expedite needed repairs.

In addition, a stockpile of replacement parts speeds up rebuilding and helps avoid delays due to suppliers or purchasing agencies. A basic maintenance guideline is to stock one complete set of parts needed to repair each model of piano in the inventory.

### B. Rebuilding

Rebuilding procedures are an essential part of any institutional piano maintenance program. Some partial rebuilding should be within the scope of every institutional piano maintenance shop. Complete rebuilding that addresses major structural components may require contracting to the manufacturer or specialty shop. A high-quality piano can often be rebuilt several times, thus extending its useful lifetime to a maximum degree.

### C. Replacement

Not all pianos are worth the investment of rebuilding. Replacement of low-quality grand pianos and of most uprights is usually more cost effective than rebuilding. Replacement of pianos in large inventories that have seriously deteriorated should be done in two ways. First, an adequate number of instruments should be replaced at the outset to remedy the most pressing needs. Secondly, a systematic schedule of annual piano replacement should be implemented.

An annual budget figure for ongoing replacement can be arrived at by calculating the replacement value of the inventory and dividing that by a number representing a target “oldest piano” age. For uprights, a suggested range for “oldest piano” would be between twenty and forty years, while for grands it would vary considerably depending on how much rebuilding is done.

#### **D. Shop Equipment and Supplies**

A properly equipped shop is essential to an effective piano maintenance program. The outfitting and upkeep of such a shop should be budgeted with the rest of the program. The following is a partial list of some of the basic tools needed for a piano maintenance shop where major rebuilding is done in house:

##### *1. Large Tools*

band saw	drill press	table saw	woodworking benches
buffer	belt sander	air compressor	storage cabinets/shelves
grinder	gantry or hoist	regulating benches	

##### *2. Hand Tools*

files	wood chisels	hand drills	sharpening stones
saws	scrapers	clamps	restringing tools
planes	wrenches	regulating tools	

##### *3. Expendable*

solvents	sandpaper	drill bits	buffing wheels
glue	compounds	saw blades	lacquer and varnish

In many institutions, it may be possible to share some equipment and possibly space with a theater scene shop or something similar. Institutions that use contractors for rebuilding will need considerably less equipment and space, but some shop space and equipment will be required in all larger programs.

#### **E. Administrative Equipment**

One of the most valuable administrative tools for managing an effective piano maintenance program is a computer with adequate software. Keeping track of a piano inventory with frequently changing room assignments, tuning requirements, work history, condition reports, and prioritized work assignments are just a few of the recordkeeping needs of a maintenance program.

#### **F. Research and Development**

High level piano work requires specialized tools and equipment that are not readily available. Time spent on custom design, manufacture, or adaptation of such tools often pays for itself many times over through increased efficiency and accuracy. In addition, the purchase of research tools such as hygrometers, durometers, balances, etc. often leads to positive results. An effective piano maintenance program should have a budget that allows flexibility for purchase of such items.

## **II. Budgeting for Smaller Institutions with Contract Technicians**

In the absence of a staff piano technician with responsibility for overseeing piano maintenance and replacement, a school should develop and implement a viable plan for piano service and replacement. This should be done with the assistance of a qualified consultant, who may often be the contract piano technician. The program should include hiring a lead contract technician (who may sub-contract some of the tuning and repair work), a viable service contract, a maintenance plan, a rebuilding plan, and an inventory replacement plan.

### **A. Inventory**

It is recommended that a parts inventory be provided for the contract technician. This may consist simply of materials for performing routine minor repairs, such as repinning action centers, re-bushing keys, performing string repairs, and replacing strings (sets of bass strings for the most heavily used models should be on hand). In some circumstances a larger range of parts and supplies may be appropriate.

### **B. Rebuilding**

Rebuilding in the college and university environment differs considerably from what is done in the retail market. Due to increased use, a college or university piano requires more frequent rebuilding procedures, but often these will not be as complete as a normal one-time rebuilding done for a private client. For example, many rebuilding shops include pinblock replacement with all restringing jobs, while it would be more appropriate in an institutional setting to restring several times using the original pinblock. Schools should rely on the judgment of a technician with institutional experience when developing a plan for ongoing rebuilding in order to get the most out of limited budgets.

### **C. Replacement**

Smaller and larger schools share similar challenges regarding replacement. It is recommended that the school establish an annual replacement budget by calculating the replacement value of the inventory and dividing that by a number representing a target “oldest piano” age.

### **D. Shop Equipment and Supplies**

Since major rebuilding work will normally be performed offsite, a complete shop is not necessary in the smaller school with the contract technician. A small shop space may be helpful to the contract technician and could reduce costs by reducing the need for transportation. The lead contract technician should be consulted in the design of this shop and should develop a list of appropriate equipment and supplies. At a minimum, shelf or cabinet space for storage of parts and supplies, and a space with a work table should be made available. It is often inconvenient and ultimately more costly to the school if a large portion of work is performed offsite.

### **E. Administrative Equipment**

Many contract technicians manage their contract school inventories with a laptop computer, which is ideally suited for keeping track of piano inventory, recording work history, and creating reports. Whether or not the contract technician is provided a laptop computer, the smaller school will benefit if the contracted technician is provided access to office space with a telephone, desk, file cabinet, and desktop computer. Local, state, and federal laws should be consulted to ascertain whether providing specific space implies an employer/employee relationship.

### **III. Other Elements in a Smaller School Program**

#### **A. Written Contract**

A written contract that articulates expectations of all parties benefits both the institution and the technician. This contract should include a description of contracted work, time element (beginning and ending), reporting, compensation, renewal, and basis for cost-of-living increases. Each situation is unique and no one contract is suitable for all, but an annual contract is essential to the success of a piano service program.

#### **B. Authority, Reporting, Subcontracting, Student Help, Vending**

The contracted technician should be delegated appropriate authority and compensated appropriately. The vending of rebuilding work, additional staffing for tuning, and the training and use of students to augment the work of the technician (e.g., clean pianos and service humidity systems), should be at the discretion of the contracted technician in consultation with a designated supervisor (most often the School/Department of Music Director/Chair). It is appropriate for the contracted technician to bill for reports, administrative and supervisory activity, and even for class presentations.

#### **C. Instruction**

Just as staff technicians frequently appear in the classroom, it is recommended that the contract technician regularly present a seminar or workshop for music majors and music faculty. Examples of subjects for short workshops might include: the structure and mechanism of the piano, principles in prepared piano use, the history of piano development with examples of historical pianos appropriate to the piano repertoire, and maintaining the pianist's instrument between service calls.

## Purchase Recommendations

The following recommendations regarding purchasing policies for pianos, parts, and related services apply equally in all situations, whether the piano technician is contracted or on staff, or the school is large or small.

1. All piano purchases for music institutions should be reviewed and approved by the lead piano technician.
2. Institutions of higher education should seek to purchase the highest quality pianos available. Pianos of lesser quality require more maintenance, have a shorter life span, do not warrant major rebuilding, and usually do not meet the musical needs of the institutions. Because of the heavy use that institutional pianos receive, instruments of lesser quality are not a judicious investment.
3. The institutional practice of seeking bids can be counterproductive to the purchase and maintenance of high-quality pianos and to the selection of qualified service personnel. Pianos, parts, and related services should not be selected by simply awarding purchases to the lowest bidder. Bidding specifications must be carefully crafted to ensure that goods and services meet the necessary high standards.
4. Major structural repairs or rebuilding should not be entrusted to the lowest bidder. This type of work is highly specialized, and only the most skilled contractors are capable of preserving the tonal integrity of a fine piano. It is critical that the lead (or possibly consulting) technician defines the scope of work, assists in selecting qualified bidders, and oversees completion of work.

## Compensation

Compensation for employed and contract technicians should be commensurate with the compensation of a highly qualified piano technician working in the local private sector and adjusted for benefits. Contract technicians should receive the same level of compensation, taking into consideration overhead costs and the fact that the contract technician must provide his or her own benefits.

## Professional Development

Staff piano technicians should receive annual support for their professional advancement. Universities with contract technicians should consider providing a portion of this compensation as well. Funding should be provided for them to participate in the annual PTG Convention and Technical Institute, as well as state and regional seminars and conferences. In addition to these events, funding should be available for further professional development, such as participation in factory-sponsored seminars, training programs in ancillary keyboard maintenance, museum exhibitions of keyboard collections, and sabbatical leave for academic advancement.

# Work Environment in Larger Institutions

Music institutions should provide a proper work environment for their piano technicians. A proper work environment is one that respects health requirements and safety codes as follows:

1. A piano maintenance shop should be of adequate size for the maintenance program. An overcrowded shop is not a safe place to work. The shop needs for any music institution can best be determined by its staff piano technicians.
2. A good ventilation system is imperative to remove dust and solvent fumes from the environment and to insure an adequate influx of fresh air.
3. An adequate dust collection system should be installed wherever woodworking machines are used.
4. Proper lighting is essential to piano work and shop safety. Natural lighting (daylight) is considered the best form of lighting and should be sought when locating a piano maintenance shop.
5. Health and safety equipment, such as eye protection, first aid kits, particle and vapor masks, gloves, and hearing protection, should be available.
6. A separate office space, outside or separated from the shop environment, should be provided for piano technicians to perform their office work.
7. Institutional piano maintenance shops should conform to OSHA guidelines.

## Climate Control

Seasonal changes in humidity and temperature play a major role in piano maintenance needs. The more extreme these changes are, the more tuning and general maintenance will be required. Furthermore, extreme changes in humidity levels usually cause serious structural damage to pianos including cracked soundboards, pinblock failure, and bridge problems. In some localities seasonal changes are minimal. However, most regions, even those regarded as temperate, experience wide year-round fluctuations in humidity and temperature. A humidity measurement and logging tool such as the Dickson Data Logger can be used to measure the humidity cycles over time to determine existing conditions.

Effective climate control will greatly improve the cost effectiveness of all piano-related expenditures. Where climate control for the building is not feasible, humidity control systems can be installed in individual pianos. Modern building climate control systems are capable of a high degree of humidity stability, but many systems under-perform or are not properly installed or maintained. In many institutions optimal control is achieved when humidity control is provided to both building and individual pianos.

Where no building system exists, it is strongly recommended that individual humidity control units be installed directly in pianos by the piano technician. Units should include a humidistat and an active humidification system. These are readily available from piano supply houses. Such units require regular maintenance (generally by adding water each week), so they should be installed only in circumstances where there is adequate staff to maintain them.

## Inventory Control

Many piano inventories have grown out of proportion to the resources and needs of their institutions. An excess number of pianos that cannot be adequately maintained offers no advantages to an institution and such pianos should be retired or traded in. An administration should work with its technical staff to determine the optimal size of a maintainable piano inventory for their institution.

## Conclusion

Piano maintenance is sometimes a neglected priority of music and academic institutions. Despite large inventories of high quality pianos and the employment or contracting of highly-skilled technicians, many music institutions have inadequate piano maintenance programs to meet their musical needs. Pianos that have been allowed to deteriorate do not properly represent the educational goals of a music institution or music department, the workmanship of skilled piano technicians, or the high-quality manufacturing of the piano maker.

The College and University Technicians Committee of the Piano Technicians Guild respectfully submits these *Guidelines for Effective Institutional Piano Maintenance* to encourage music institutions to provide the necessary resources to preserve their valuable investments in pianos and to ensure that students, faculty, and guest artists have access to the high quality instruments they deserve.

# Glossary

- Action** - The internal mechanism of a piano, consisting of several thousand moving parts made of a wide variety of materials.
- Action Regulation** - The adjustment of action parts to their proper specifications.
- Bridge** - A wooden structure (between the strings and the soundboard) that transmits string vibrations to the soundboard.
- Center Pins** - Small pins that form the precision pivot points of moving action parts. There are over 600 center pins in a piano action.
- Damper** - A felt cushion attached to a lever assembly that stops the vibration of the strings.
- Hammer** - The mallet that strikes the piano strings, made of very dense felt wrapped around a wooden core.
- Hammershanks** - The thin wooden levers on which the hammers are mounted.
- Hammer Filing** - The process of reshaping the hammers and removing worn layers of felt.
- Key Bushings** - Felt or leather bushings glued into mortises in the keys that enable them to move quietly.
- Key Covering** - The visible surface of the key usually made of ivory, ebony, or plastic.
- Pinblock** - The wooden structure that holds the tuning pins in place.
- Rebuilding** - The process of replacing major parts of the piano or sets of parts. This may also include case refinishing.
- Reconditioning** - Restoring the condition of existing piano parts and their functions.
- Regulation** - See Action Regulation.
- Repetition** - A small assembly of wooden levers, springs, felt, and buckskin cushions that is part of a grand piano action. There are 88 repetitions in an action.
- Restringing** - Replacing a set of piano strings.
- Shanks** - See Hammershanks.
- Soundboard** - A large, thin, wooden diaphragm that amplifies the vibrations of piano strings.
- Strings** - The steel and copper wires that produce the musical tone in a piano. There are three strings per note throughout most of the piano range.
- Tuning** - Adjusting the tension of the strings to produce desired pitches.
- Tuning Pin** - The threaded steel shaft that keeps the strings at the proper tension. There are nearly 250 tuning pins in a piano.
- Voicing** - Adjusting the shape, density, and resilience of the individual hammers for desired tonal quality and uniformity.

# Appendix

## Workload Formula

The Workload Formula begins with the general recommendations stated earlier in this document and adapts them to specific situations. An inventory of new instruments will require less rebuilding and reconditioning than a fifty- to seventy-year old inventory, at least in the short term. Climate control, or lack thereof, has a profound effect on tuning and regulation stability, and on long-term structural integrity. The intensity and duration of use a piano receives will determine how rapidly its action will wear out and how much attention it must receive.

“Age,” “Climate Control,” and “Usage” are among the seven factors which have a predictable impact on workload and staffing needs. Though not an absolute standard which would apply to any situation, this formula will provide reasonable guidance, both for establishing an initial level of staffing, and for analyzing the impact of changes (i.e. installing humidity control, replacing a major portion of the inventory). The variables are described in detail in the following pages.

For ease in making the somewhat complicated calculations, spreadsheet templates have been developed by members of the CAUT Committee, and are available for download from the CAUT web page. This can be accessed via a link from [www.ptg.org](http://www.ptg.org), the PTG web page.

Based on a proportional relationship between work required by a normal array of instruments, this formula is intended for use with the entire inventory of pianos. Entering numbers for a partial inventory may yield unreliable results.

## To Use the Workload Formula

1. Choose the Base Workload that best describes the institution.
2. Assign each piano in the inventory a numerical rating for each of the seven variables as described below: Condition (C), Rebuilding Parameters (RP), Climate Control (CC), Age (A), Usage (U), Upright/Grand (U/G), and Standard of Maintenance (SM).
3. Calculate the average rating of the inventory for each of the seven categories.
4. Find the Recommended Workload (RW) according to the formula (Base Workload x Condition x Rebuilding Parameters x Climate Control x Age x Usage x Upright/Grand x Standard of Maintenance = Recommended Workload). The result will be the theoretical number of pianos that one full time equivalent technician can maintain.
5. Number of pianos at the institution / Recommended Workload = Number of Technicians needed to maintain the pianos.

Example for calculating the number of technicians (see complete category names above):

# Pianos	Total C	Total RP	Total CC	Total A	Total U	Total U/G	Total SM
174	163.20	156.00	111.00	180.20	266.10	163.00	244.50

Base	AVG C	AVG RP	AVG CC	AVG A	AVG U	AVG U/G	AVG SM	RW
60	x 0.94	x 0.90	x 0.64	x 1.04	x 1.53	x 0.94	x 1.41	= 67.10

174 (Total Instruments) / 67.10 (Recommended Workload) = 2.59 (# of Technicians)

## Description of Variables for Workload Formula

The numbers generated by the workload formula are useful beyond simply producing a “Recommended Workload” and a recommended staffing level. They can also provide insights into specific needs and long term planning.

Each calculated factor (multiplier) will be a number between 0.1 and 2.5. Under the design of this formula, calculated numbers will generally be fairly close to 1.0 for most factors in most average situations. When the numbers produced by the formula are 1.2 or above, or 0.8 or below, this may indicate special circumstances that deserve scrutiny. Some examples:

1. Under “Climate Control,” numbers under 0.8 indicate conditions that lead to tuning instability and other deterioration of pianos. Humidity control in the building is strongly encouraged in these cases. Alternately, humidity control systems can be installed in individual pianos. Investment humidity control is probably the single most cost-effective investment in terms of achieving and maintaining high standards.

2. Under “Condition” and/or “Age,” low numbers indicate a need to consider contracting out a fairly large amount of rebuilding/reconditioning work over the short term, and/or investing in new pianos. High numbers in these areas indicate a new inventory, which can be expected to deteriorate over time if plans are not made for regular replacement. In other words, if staffing is based on these numbers without simultaneously committing to a regular program of replacement, staffing needs will increase and/or quality will suffer over time.

3. Under “Usage” and “Standard of Maintenance,” low numbers will generally indicate a conservatory or performance oriented situation, while higher numbers will indicate more of a “general” music department situation. If this is not the case, low numbers may indicate an inadequate inventory, while high numbers may indicate more instruments than are necessary.

### Base Workload (Base)

- 40 - Conservatories and top performance situations with national recognition.
- 60 - Schools with a performance and education emphasis; schools that are a part of a larger educational/research institution that ranks nationally (well-known land grant universities, liberal arts colleges with strong music programs).
- 80 - Schools with an education emphasis but with strong performance areas (general land grant institutions, broad based liberal arts colleges).
- 100 - General education music departments in institutions where music is not particularly emphasized or where music does not play a major role in campus life.

### Condition (C)

- (1.3) - Excellent: Piano needs regular maintenance--regulation, tuning, and voicing.
- (1.0) - Good: Piano needs some minor reconditioning--hammer filing, key re-bushing, minor action pinning, regulation, tuning, and voicing.
- (0.8) - Good/Fair: Piano needs major reconditioning--hammer replacement, major action repinning, key re-bushing, regulation, tuning, voicing.
- (0.6) - Fair: Piano needs partial rebuilding--new hammers and other action parts, restringing with existing pinblock, regulation, tuning, and voicing.
- (0.4) - Fair/Poor: Piano needs major rebuilding--new pinblock, soundboard repair, new strings, tuning pins, action parts, regulation, tuning and voicing.
- (0.2) - Poor: Piano needs complete rebuild/remanufacture--new soundboard and bridges, pinblock, new strings, tuning pins, action parts, regulation, tuning, and voicing.

*Note: Categories “Fair” through “Poor” should only be applied to pianos that will receive the described level of work. For loan program pianos, assign (1.0).*

## **Rebuilding Parameters (RP)**

- (0.4) - Piano will receive complete rebuilding/remanufacturing, including new soundboard and bridges, and possibly new keyboard.
- (0.6) - Piano will receive major rebuilding, including soundboard repair and new pinblock.
- (0.8) - Piano will receive minor rebuilding, including restringing with original pinblock, complete action parts replacement.
- (1.0) - Piano will receive major reconditioning, including new hammers and possibly shanks/butts, major repinning.
- (1.2) - Piano will receive minor reconditioning, filing hammers, re-bushing keys, regulation.

*Note: Each category represents the maximum rebuilding/reconditioning care the individual piano will receive. These parameters are expected to apply over the life of the piano, and to apply to work done at the institution. For loan program pianos, assign (1.0).*

## **Climate Control (CC)**

- (1.4) - Excellent: 5% (percentage point) maximum variance in relative humidity (generally achievable only with complete humidity control unit installed and well-maintained, with back covers on uprights, string and bottom covers on grands; and with ambient humidity within 20%).
- (1.2) - Very good: 10% maximum variance in relative humidity (or has complete humidity control unit installed and well-maintained, with back covers on uprights, string and bottom covers on grands).
- (1.0) - Good: 20% maximum variance in relative humidity (or has complete humidity control unit installed and well-maintained).
- (0.8) - Fair: 40% maximum variance in relative humidity.
- (0.6) - Poor: 60% maximum variance in relative humidity.
- (0.4) - Very Poor: variance in excess of 60%.

*Notes with respect to piano installed humidity control systems:*

*Variance in humidity is by far the largest factor in maintaining tuning stability. It affects stability of regulation and voicing, and it has structural effects on the long term integrity of every piano (particularly soundboards and pinblocks). The effect of humidity variance is amplified many-fold in modern institutional environments due to code requirements for HVAC systems. Modern HVAC systems exchange the entire volume of air in the building many times a day. As a result, air is in constant motion (leading to more rapid movement of moisture between air and wood), and changes in outside humidity are reflected almost instantly within buildings.*

*The importance of humidity control to the quality of piano service cannot be overemphasized. The multipliers for “fair” through “very poor” are very conservative in terms of showing the effect of large-scale humidity change on overall tuning quality and general long term need for rebuilding and replacement of instruments.*

1. *It is likely that a complete system without back/bottom/string covers can bring a piano into the "Very good" category if the variance in the building is no more than 30%. Some discretion should be used in assigning categories.*
2. *"Half systems" (a humidistat with a dehumidifying unit) can help in situations where ambient humidity rises above 50% on a regular seasonal basis. In general, such a system might improve tuning stability by one step. Complete systems are strongly recommended wherever possible under most conditions where humidity varies more than 15%.*
3. *There is a certain amount of maintenance time involved for complete systems. Most of this maintenance is unskilled and can be accomplished by a work study student to free up technician time.*
4. *Systems must have the appropriate wattage and position of components, as recommended by the manufacturer, to produce the predicted level of effectiveness.*

### **Age (A)**

- (0.9) - 1 - 2 years old. (Applies particularly to piano loan programs.)
- (1.3) - 2 - 15 years old.
- (1.0) - 16 - 30 years old.
- (0.7) - 31 - 45 years old.
- (0.5) - over 45 years old.

### **Usage (U)**

- (2.0) - 0 to 4 hour--light usage.
- (1.7) - 4 to 8 hours--light usage.
- (1.3) - 8 or more hours--light usage.
- (1.3) - 0 to 4 hours--medium usage.
- (1.0) - 4 to 8 hours--medium usage.
- (0.7) - 8 or more hours--medium usage.
- (0.8) - 0 to 4 hours--heavy usage.
- (0.6) - 4 to 8 hours--heavy usage.
- (0.4) - 8 to 12 hours--heavy usage.
- (0.3) - more than 12 hours--heavy usage.

*Note: Heavy usage is generally what would be found in piano major practice rooms, piano faculty studios, and busy recital/rehearsal halls. Medium usage is similar to what would be found in most voice studios. Some discretion must be used for those pianos that get a wide variety of levels of use.*

### **Upright or Grand (U/G)**

- (1.1) - Upright
- (0.7) - Grand

## **Standard of Maintenance (SM)**

- (0.1) - Top performance: Piano is maintained in meticulous condition at all times: tuning, voicing, and regulation at highest possible standard, with daily or near daily attention; rebuilding and reconditioning on an accelerated schedule so that the piano is kept virtually “like new.” (Generally used for concert instruments in recital hall.)
- (0.4) - Near top performance: Piano maintained as above, but with weekly to twice-weekly attention, and somewhat slacker rebuilding schedule. (Generally, applies to piano teaching studios and the like. In many situations may apply to concert instruments.)
- (0.7) - Excellent: Piano kept near performance level--well tuned, voiced, and regulated. Weekly to bi-weekly attention. Rebuilding and reconditioning on a regular basis.
- (1.0) - Very good: Piano kept at an acceptable musical level--tuned, voiced, and regulated on a regular basis. Bi-weekly to monthly attention. Reconditioned on a regular basis.
- (1.3) - Good: Piano kept at an acceptable musical level--tuned, voiced, and regulated on a regular basis. Monthly to bi-monthly attention. Reconditioned on a regular basis.
- (1.8) - Fair: Piano kept at an acceptable musical level--tuning allowed to deteriorate before retuning; voicing and regulation kept at acceptable levels. Once to twice a semester attention.
- (2.5) - Minimum: piano tuned twice a year; all keys “working.”

## Acknowledgments

*Guidelines for Effective Institutional Piano Maintenance* was originally conceived as a document for the State University of New York by the piano technicians of SUNY. Special thanks to our SUNY colleagues, Lou Tasciotti, formerly SUNY Potsdam; Joseph Vitti, SUNY Stony Brook; Gary Shipe, SUNY Buffalo; and Tom McNeil, SUNY Fredonia, for their contribution to this project.

The College and University Technicians Committee of the Piano Technicians Guild would like to acknowledge the author of this publication, Lou Tasciotti, University of North Texas, for its inspiration and realization, and for the special help of its co-author, Robert Grijalva, University of Michigan at Ann Arbor. The publication of this document by the CAUT Committee would not have been possible without the efforts of Tom McNeil, Committee Chairman, who provided us with the leadership we needed in our formative years as an organizational body. During the 2004 revisions, Bill Shull led the efforts to include material addressing small school and contractual concerns, while Fred Sturm directed the process of revising the workload formula and general editing. Don McKechnie headed the editorial subcommittee.

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