

Training Needs Assessment for the NYC Housing Authority Heating Plant Technician (HPT)

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1. EXECUTIVE SUMMARY

This assessment is conducted to provide the basis for understanding training needs of the Heating Plant Technician (HPT) position within the context of the NYCHA organizational structure and existing physical infrastructure conditions. The organizational goal of reducing carbon emissions by improved energy efficiency in heating operations is undercut by current difficulties in meeting basic performance objectives of heating reliability and equipment “state of good repair”. However, better meeting these basic objectives would improve energy efficiency. From this perspective, it has been suggested that adoption of retro-commissioning principles would be a useful framework, focusing HPT staff on returning heating infrastructure to proper operation, as opposed to fighting daily fires.

Our findings suggest that training can be an important part of such a shift, if situated properly within a strategic management approach. There are a definable set of infrastructure conditions that need to be addressed and training can help focus staff on them. To this end, we recommend a training structure of modules, combined with in-field mentoring, associated with a series of initiatives aimed at specific heating infrastructure issues, providing HPT staff with specific hands-on skills for that issue, along with knowledge of how the specific issue fits into overall system function.

Retro-commissioning also incorporates a data-driven approach to operating conditions. Performance quantification is a critical aspect of process improvement. As digital systems become more and more part of our infrastructures, more and more data becomes available. Ability to make use of this data is a key challenge, as it must be translated into performance indicators and then used to guide and track improvement. Understanding of both the physical infrastructure and its data-based indicators are needed. Our findings in this respect go beyond our original task regarding HPT, to more experienced technicians; “Advanced HPT” and Heating Plant Supervisors (and Assistant Supervisors) require appropriate training for work in digital environments, interfacing between NYCHA’s IT resources on the one hand and their HPT charges on the other.

Over recent years, HPT staffing has been reduced for varied reasons, with losses most significant among experienced senior technicians. In some cases, movement to other positions within the NYCHA organizational structure effectively removes skilled technicians from involvement with heating plants. In other cases, vacated positions have been left unfilled. Upper level management’s apparent belief that introduction of the Computerized Heating Automation System (CHAS) would quickly decrease the need for skilled workers in the field was in error. In fact, the introduction of digital controls requires a more skilled workforce.

The existing initial training program for incoming HPTs is well-established and comprehensive. Weakness is identified in the new HPT’s transition to mechanical/electrical task requirements once on the job. The mechanical aptitude of the entering HPT is suspected to be inconsistent and specific task-related hands-on training occurs primarily in the field, after completion of initial training and new-hire probation. Adjustments to the initial training program should be considered, including investment in new facilities for hands-on mechanical activities, but formally recognized and improved mentorship and on-the-job training is identified as the most critical element in enhanced training and attainment of skills. Initial

assignments for new HPT at sites with less challenging equipment conditions may be a more effective transition from initial training. Training for managers and supervisors of the HPT workforce is also recommended, including train-the-trainer for mentorship skills and use of data-driven metrics for quantified monitoring of both system conditions and workforce performance.

Review of available certifications and trainings failed to identify one that would comprehensively suit all the current needs of the HPT workforce. Over a longer timeframe, it may be possible to create and define HPT gradations, as a career ladder that could be pursued utilizing multi-level training and certification, such as that of the Building Owners and Managers Institute International (BOMI). For the current situation, however, a customized training program, including classroom teaching but heavy emphasis on on-the-job elements, is recommended.

The recommended training program would be based on a modular, quantifiable approach to specific learning-and-practice improvement areas, with topics identified from existing needs “on the ground” in ongoing NYCHA facility practice. Topics would be associated with Key Performance Indicators (KPI) to provide quantitative tracking of progress. Training modules would be developed as “refresher” offerings and associated with “campaigns” to improve one or another specific area of performance, rolled out sequentially over time. We suggest that this approach, rather than one based on externally available certifications, will be most compatible with the present needs of the system and the workforce.

2. INTRODUCTION AND BACKGROUND

Heating plants are one main element in NYCHA infrastructure and their operating condition is key to both the provision of essential services (heat and hot water) and the energy and cost efficiencies with which they are delivered. Heating plants are responsible for a large portion of NYCHA’s carbon emissions; the efficiency of heating plants is therefore a critical element in the agency’s sustainability planning and the HPT position can be considered a “green job.”

A heating plant is understood to be all the infrastructure, equipment and devices extending from central plant locations to terminal elements in apartments. The heating plant is also understood to include the equipment for generating and delivering domestic hot water (DHW), as DHW equipment is most often fed with steam from the central boiler plant. The most common NYCHA configuration is that of a campus system with a central boiler room delivering steam, via underground steam piping, to “tank and pump rooms” located in building basements; condensate is then returned from these rooms back to the central plant. The age and condition of distribution piping is a major factor in the operation of these systems.

2.1 Purpose and Objectives of the Study

The purpose of this study was to better understand the training needs and improvement opportunities for the Heating Plant Technician job category and to make curriculum and possible certification recommendations on the basis of this understanding. Initial discussions also suggested exploration of possibilities for adapting the HPT position to a retro-commissioning or ongoing commissioning model.

At the end of the study period, based on review of the draft report, it was realized that the training needs of those managing the HPT (Heating Supervisors and Assistant Supervisors) should also be included. Such consideration has been added based on limited discussion with NYCHA staff and consideration of staff hierarchy and development over time, especially with respect to digital resources

2.2 Acknowledgements

Our work was supported throughout its course by key NYCHA staff. In particular, Adalberto Aquino, Robert Knapp, Javier Almodovar and Edwin Mendez shared their time and, more importantly, their insights at multiple meetings. Their perspectives provided a valuable window onto the situation of the HPT. We must also thank Bomee Jung, Vice President of Energy and Sustainability, for commissioning the project and providing its charge and framework.

2.3 Background Topics

Training needs for any positions are strongly affected by the work and organizational environment.

2.3.1 HPT Recruitment and Evaluation. NYCHA maintains a policy of using its workforce to create employment opportunities for the local population. This worthy goal does place stress on the system, especially where positions require technical knowledge and mechanical aptitude. Reports suggest that new HPT recruits show a wide range of background and capability, with little in the way of testing/assessment protocol to distinguish such levels. The initial 27-session HPT training, conducted at the NYCHA Heating Training Center in Sheepshead Bay, performs an essential function in preparing new recruits for introduction into the system. Evaluation of the Training Center program was not part of the scope for the present work and was not specifically investigated. Discussions, however, indicated need for adjustments to the program to include better skills assessment procedures and more lab-based mechanical work. Across the HPT career path, there is little quantitative performance evaluation in place.

2.3.2 The Job Context and Work Processes. NYCHA managerial staff brought a strong perspective on the situation of the HPT position, both the current situation and the recent organizational history leading up to it. Their view was supported and confirmed by findings from focus groups of HPT. The general perception is that, with certain exceptions, the HPT workforce is struggling with issues of staffing level and skills to meet the system's needs and that morale is low. More detailed discussion can be found in section 3. One critical aspect of the job/work context is that HPT are isolated on a site, often working singly and with supervision and support from remote locations.

2.3.3 HPT Managers. Towards the end of the project, consideration was requested for attention to the needs of HPT Managers, primarily District Heating Supervisors and Assistant Supervisors. Discussion indicated that these positions are generally filled by experienced technical staff who have moved up through the organization and have strong knowledge of existing NYCHA heating system equipment and conditions. There is no formal training associated with advancement to these positions or prescribed once in them. A difficulty for the HPT Managers is that they supervise multiple sites and therefore have direct contact with HPT, who are on sites, on only a rotating basis. It is at this level that CHAS access is available but use of data from CHAS appears to be limited.

2.4 Methods

The project was led and largely conducted by Michael Bobker, Director of the CUNY Building Performance Lab and a well-recognized authority on the training of building staff for energy efficient operations. Mr. Bobker took part in discussions with key staff and led focus groups of representative Heating Plant Technicians.

2.4.1 Review of Materials. Materials reviewed, as provided by NYCHA staff, included the HPT job description, the NYCHA HPT training curriculum, BPI/AEA certification agreement with curriculum for Advanced HPT. An original (“red book”) text, developed by NYCHA staff, covering details of equipment and maintenance procedures, was also reviewed. CHAS reporting was reviewed in coordination with a separate CHAS study conducted in parallel by CUNY BPL. A next level of assessment would include review of sample on-site records (e.g. - logbooks) and computerized work-order system records but is beyond the scope of the present study. Background documents reviewed are listed and, where possible, provided, in Appendix A.4.

2.4.2 Discussions and Focus Groups. The central method used was guided conversation with and careful listening to NYCHA staff at various levels related to the management of heating plant. Discussions with supervisory staff were conducted in meetings planning and preparing for this study. Two focus groups were conducted with slightly different sets of participants, based on experience and seniority. A rather consistent view emerged across organizational lines which we have tried to capture and present in this report and upon which recommendations are based. Documentation of the focus groups is provided in Appendix A.3.

2.4.3 Coordination with CHAS Study. Based on a parallel project evaluating CHAS, we reviewed reporting capabilities of the CHAS system, to better understand what information was available to plant managers and technicians. Upon discovery that HPT do not generally use or even have access to CHAS, we did not pursue this aspect of investigation. We do note, however, that the CHAS reporting is limited in its scope and, we believe, could be much more effectively developed for both plant managers (heating supervisors) and technicians (HPT). The CHAS report found that some key performance points are monitored and reported on but that data is inconsistently acquired and that the addition of new points and/or development of new reports is very limited by dependence on an outside contractor.

Recommendations regarding access to and use of data may especially impact HPT Supervisors. Changes to CHAS for better data access and usability, would certainly entail a parallel need for staff training in order for such added capabilities to be used effectively. Further, in line with training recommendations made in this report, it could be most useful to have specific measurement and metering points added to the system for use in performance monitoring under specified initiatives or “campaigns”, as is suggested separately.

2.4.4 Review of Available Certifications. CUNY BPL has previously been responsible for researching and comparing available certifications for building operations and energy efficiency, including background work for the NYC Mayor’s Office of Sustainability. This work was updated with specific reference to the

HPT position to examine the match of various programs to specific HPT work requirements and revealed needs. The annotated review of Certifications and Other Training Programs is provided as Appendix A.2.

2.4.5 Curriculum Development. Development of curriculum was beyond the scope of this assessment. Typically, training curriculum is developed on the basis of findings of a training needs assessment (such as this report), beginning with articulation of Learning Objectives. A first goal was considered to be finding appropriate curriculum from existing training offerings; this is considered via review of available Certifications and associated training. Because of the unique situation of NYCHA and its HPT, we believe that, instead, a customized approach is needed, at least initially. This is discussed further in sections 3.3 and 3.4 and Appendix A.1.

3. FINDINGS AND RECOMMENDATIONS

3.1 Job and Work Context

Training needs cannot be properly understood independent of the job and work context. Therefore, discussions included this topic. It was subsequently discovered that a separate NYCHA group was at work evaluating business/work processes; our findings were shared, found generally convergent, and at least several of our recommendations were adopted into the findings and recommendations of that group.

Career Pathway. A staged career pathway does not appear to exist or at least is not well perceived by HPT. The number of senior “Advanced HPT” has declined significantly over the recent past. Experienced, senior HPT commonly move into site superintendence, where their skills are lost as heating plant resources. Vacated positions have not been re-filled. The special-purpose Certification training and test created with the Association for Energy Affordability (AEA) and the Building Performance Institute (BPI), has not been offered in over ten years. Early-career HPT do not seem to see a connection between job performance, increasing skills/responsibilities, and career advancement with improving compensation.

Quality of On-the-Job Experience / Job Satisfaction. HPT participants were found to regard themselves with pride in their capabilities. However, they also feel over-loaded, frustrated, and are sensitive to unevenness of performance among their peers. They express concerns about on-the-job safety and working conditions (e.g. – sewers frequently backed up with standing water in basements, pump rooms; long periods of working alone). These perceptions do appear to vary by borough-level organization, with higher team and individual morale where plant conditions are better under control (Queens, SI). The variation in conditions and experience of work between different sites was very apparent in discussion. We believe that senior technical staff understand well the drivers of these differences but they have not been articulated in a systematic way that would make them available for strategic planning and intervention purposes.

Outsourcing. Outsourcing of activities to outside contractors has increased, especially for sites that are seen as having problems and work-order backlogs and for services that can be supplied on a contracted routine basis (e.g. – boiler water treatment). Despite the apparent promise of help to a stressed

workforce, HPT generally see this as a threat and implicit criticism. Ambivalence about cooperating with outside contractors was expressed, along with lack of clarity about roles and responsibilities.

HPT Management (Heating Supervisors and Assistant Supervisors). Heating Plant Supervisor is a key career pathway step for HPT and they have a critical role in assessing both physical plant conditions and workforce performance, even though handicapped by being located remotely from sites. HPT Management (Heating Supervisors and Assistant Supervisors) have access to CHAS reporting on the limited set of system parameters presently included and also to Work Order reporting from the Maximo system. However, use of data at this level appears to be constrained by a series of limitations: press of day-to-day events, system hardware and software, programming skills available, and staff level of comfort with data analytics. While no baseline assessment was performed, it does appear that staff in these positions could benefit from improved **skills in development and use of data-derived metrics to assess both system conditions and workforce performance.**

Recommendations

The following recommendations are developed from the findings described in this section:

- **Create a clear career development pathway within the HPT title.** This should be associated with clear knowledge/skill competencies and milestones that can be tested for and/or observed in records of job performance. This is recognized to be a longer-term recommendation as it probably requires re-visiting of job descriptions and labor agreements.
- **Analyze and understand the drivers of better (less stressed) and worse (more stressed) sites.** Such understanding may contribute to strategic approaches addressing conditions at stressed sites, including staffing considerations. Consider how less stressed sites may be useful in providing more beneficial transitional learning environments for new HPT (see also recommendation in section 3.3 below).
- **Clarify Outsourcing policies & practices with respect to the HPT.** This includes defining a clear HPT role with respect to contractors that establishes such things as rules for contractor access, storage of materials, recording of contractor activities, responsibilities for supervision and sign-off on contractor task completion, etc.
- **Define data-centric tools and functions for Heating Plant Supervisors.** Such tools and functions can start simply and be gradually built up over time along with skills for data acquisition and use (see also “KPI” in section 3.2 following).

3.2 Work Processes and Performance Quantification

Like “Job and Work Context”, work process issues are not formally within the scope of the present investigation. However, it is impossible to consider training needs without such context. In the course of discussion along these lines, a variety of issues came to light that impact the HPT effectiveness and professional development needs.

Work Orders and Preventive Maintenance Task Completion. Recent technology introduction has impacted the work order process. Work orders are now delivered electronically on a twice-daily basis using a Maximo platform. Close-out of work orders is stressed and tracked. HPT appear to have adapted well to the delivery of work orders via hand-held devices and cell phones, with only minimal training. This suggests that **mobile devices may be a useful platform for further data collection and system-condition monitoring.** Products, such as the NYC-based start-up LogCheck, are available to replace paper-based recording of system readings with cloud-based data acquisition and warehousing. System managers gain major advantages from such a data process. For the field worker, the mobile interface can be configured much like a paper checklist associated with daily rounds, equipment status checks, and gauge readings. Early experience with operators indicates that acceptance is quite easy and fast after a minimal amount of training.

Work orders are prioritized on a coded system, with a “no-heat, code 7” taking precedence over most other codes. HPT describe their working day as starting out with plant safety checks and then moving on quickly to prioritized work orders. Inevitably, some work orders are not resolved within the course of a day and lower priority work orders, such as preventive maintenance tasks, may be interrupted and remain incomplete for substantial periods of time. ***In particular, as “no-heat, code 7” work orders take HPT to apartments on a priority basis, they interfere with HPT ability to complete infrastructure work for central plant and building-level systems. This can lead to a disastrous spiral, as more no-heat complaints are made because system-level problems are not fixed and continue to worsen.***

Performance Quantification. Performance Quantification comes in two flavors, the first utilizing work order histories and the second using physical measurements of specific plant conditions. Quantification of key system operating conditions over time is at the foundation of the family of **commissioning (Cx) techniques for existing buildings** (retro-Cx, ongoing Cx, Continuous Cx ©, monitoring-based Cx, Building Re-tuning).

Work orders are presently tracked for completion and for work backlog. It does not appear that further performance metrics are yet in place. Work orders can be a valuable source of information regarding both system conditions and the state of practice of the workforce and of specific individuals. Understanding derived from such data can be important for the planning of training interventions and prioritization of skills to be cultivated.

Certain physical measurements are presently included in CHAS and could be used more systematically as KPI. Records reviewed in the separate CHAS study showed a high degree of missing data from reports; the cause of such missing data would have to be determined and corrected for its effective use. We are confident that any next generation development of CHAS will increase the availability of control/data points and the ease of trend and report set-up, enabling the kind of quantification that is at the heart of retro-commissioning or, better, ongoing commissioning.

Contribution to Energy Efficiency. HPT do not appear to have specific energy efficiency objectives; no indication was provided of regular observations made, recorded, and evaluated for such purposes. Many operating conditions and practices that were conveyed anecdotally have severely negative impacts on energy efficiency, other operating costs, and equipment life; an example is the addition of un-metered, un-treated fresh water to vacuum/return tanks (i.e. – via a hose) to offset system leakage. The on/off scheduling and cycling of boilers and steam trap leakage are other areas where regular data collection can lead to improved operations with major energy efficiency implications. These kinds of practice-improvements can be considered a form of retro-commissioning and can help staff achieve better understanding of how full systems are supposed to work and the implications of their not doing so.

Recommendations

The following recommendations are developed from the findings described in this section:

- **Focus HPT work on central plant and building-system level infrastructure.** This likely requires adjustment of HPT work responsibilities with respect to apartment no-heat calls.
- **Use Work Order (Maximo) data for both system condition and workforce performance quantification** that can show patterns of recurrent failure, repair tasks where specific training is needed, and individuals who are better and worse at specific procedures.
- **Develop and implement Key Performance Indicators (KPI), based on measurement of plant variables that will signal good operation, including energy efficiency.** KPI can be rolled out incrementally, in small steps, associated with training/plant improvement initiatives under a rubric of retro-commissioning or ongoing commissioning

3.3 Training and Training Needs

Initial Training and the Heating Training Center. Especially because of NYCHA’s commitment to hiring policies that provide opportunity for local residents, training from the ground up is essential. The Heating Training Center in Sheepshead Bay has performed this function for decades. The materials covered are comprehensive and detailed, incorporating both general principles and equipment specific to NYCHA. The ability to test and select for mechanical aptitude was questioned in discussion and was recognized as problematic for the Training Center; the curriculum as presently configured is not able to fully address the range of basic knowledge and skill competencies of new entrants.

Preparedness and Placements Following Initial Training. There is a significant hurdle in moving from the HPT training to actual hands-on practice in the field and many new HPT appear to be weak in their preparation for mechanical work. As such, some new entrants need more support than others; being thrown directly into high-need, high-stress work conditions may doom them to failure or at least to very low morale. Some borough operations are better able to support and break-in new HPT than others. Such knowledge of trainees on the part of trainers does not appear to figure consistently into initial assignments, being outweighed by geographical considerations.

In-field Mentoring and Ongoing Training Opportunities. In-field Mentoring is regarded by workers and supervisors as the key to successful HPT development but is not delivered consistently across the organization, nor is it formally recognized as a much-needed and compensable skill. **It is a listed part of the Advanced HPT duties (see Appendix A.4.2, item D.9)** but reduced staffing and high work load of Advanced HPT makes in-field mentoring a challenge. Also, while class opportunities for periodic refresher/deepening training are available to HPT through the Heating Training Center, taking these classes is not mandatory nor appears to be strongly encouraged.

Knowledge Needs and Curriculum. Existing documents show topics with which HPT are to be familiarized, primarily in terms of heating systems and specific kinds of equipment. We did not find expressed Objectives in terms of Competencies to be achieved at different stages of the HPT career.

Specific skill/competence needs did become apparent in discussions, especially as related to abilities to diagnose and address field conditions and equipment failures. These included **underlying skills such as basic mechanical work techniques, and safe and advanced use of electrical test instruments, equipment troubleshooting and failure diagnosis, and more broadly cognitive skills** for understanding why certain operating conditions would lead to certain kinds of failures, for example, steam trap and zone valve functions leading to vacuum pump failure or excessive system water additions leading to boiler tube failure.

It does appear from discussions that there are a limited set of specific areas/kinds of failure that are common across heating systems. These should be further articulated and understood for training requirements. An initial example of such development is provided in Appendix A.1.

The logistics of the HPT workforce, generally working alone on separate sites and, in many cases, without a senior technician within easy reach, poses significant difficulties for training delivery to the existing workforce. This challenge requires further consideration with management.

Training Needs of Advanced HPT and Heating Supervisors (including Assistant Supervisors). A training program for “Advanced HPT” was provided by the Association for Energy Affordability (AEA), leading to certification by the Building Performance Institute (BPI), but has not been repeated in at least ten years. The Heating Training Center offers a broad array of specialized courses that can be taken by HPT at their discretion but appear to be under-utilized (a review of offering enrollment data could be conducted to verify this perception).

Recommendations

The following recommendations are developed from the findings described in this section:

- **Improve laboratory facilities and hands-on training in the initial training program.** This will require investment in the Training Center facilities, as well as a review of the curriculum. It may be more effective to have a very firm grounding in a limited set of mechanical/electrical skills/tasks and

introduce further content later in HPT's careers.

- **Adjust Policies for Initial Placements.** Given transition difficulties from classroom to hands-on fieldwork, sites with better operating conditions may provide a more successful first assignment for new HPT. A review of initial assignment policies may reveal improvements that could result in better outcomes.
- **Formally develop Mentoring skills and responsibilities of senior ("advanced") HPT.** While a listed part of the Advanced HPT job description (Appendix A.4 item D.9), it is difficult in practice to implement, given the need to complete tasks and the logistical difficulties posed by geographically separated sites. Nevertheless, developing on-the-job and mentoring methods and supporting their application is identified as a crucial task for HPT workforce improvement.
- **Develop an updated list of Competencies, to be required at various stages of career development,** that can be achieved over time by continuing education and for which specific tests can be developed, to be associated with internal Certificates. This list should start with a review of skills and competencies expected at the end of initial training and after some period of initial field assignment. This list can then be used to develop specific Learning Objectives for training curricula. Further career advancement can be associated with under-utilized offerings at the Heating Training Center and external trainings that may be made available. *Training for identified key competencies may be bolstered through the use of new media, such as U-Tube lessons, that can be used remotely.*
- **Introduce scenario-based instruction into classroom activities,** based on typical conditions encountered and in conjunction with training on specific kinds of system/equipment failure modes and diagnosis. Scenario-based instruction simulates field conditions with problem situations that require students to think through their actions, review and discuss them. This can be a valuable complement to hands-on skills training and on-the-job mentoring.
- **Develop and deploy a modular approach to training that can be associated with improvement campaigns.** The ability to identify specific areas/kinds of failure that are common across heating systems suggests modular treatment by topic. Topics can be addressed sequentially, as improvement initiatives or "campaigns" are rolled out with quantitative baselines and improvement metrics (KPI) established. Key data should be acquired, perhaps by manual readings but much more usefully by continuous-read installation, such as automation system (CHAS) readings where available and use of data-loggers where not. Training in installation and use of data-loggers would be part of the training for a given improvement initiative. Development of field-accessible resources may also be possible for commonly encountered conditions
- **Identify long-term Knowledge Needs and Curriculum for HPT, especially as associated with work in digital environments.** While mechanical and diagnostic skills dominate current training needs, longer term needs are identified associated with skills for working in a digital environment of controls and data-based performance monitoring. Development of KPI recommended above requires training for

HPT, especially senior and supervisory technicians, in their use, including industry practices for data acquisition and utilization available from automated control systems and associated databases.

3.4 Certifications and Associated Training

Certifications are a means for standardizing a base level of knowledge and skill for a job classification across an industry. Where life-safety is involved, the certification usually takes the form of a License, issued by a state or municipality, establishing a legally mandated level of expertise and associated legal liability for practice. Other Certifications may be created by industry groups seeking to establish shared base levels of standardized competencies in employees across their industry. The process for creating an industry-based certification is regulated by ANSI (the American National Standards Institute) or, in Europe, by the ISO (International Standards Institute). A Certification endows an industry or professional status and must be maintained over time by the individual title holder, by demonstration of continued practice, currency in industry practices, usually by accumulation of approved continuing education credits, and annual payment to the certifying body.

Under strict ANSI practice, the certification body cannot provide training for their certification. Rather, the certifier establishes a qualifying examination and other criteria (e.g. – experience) and public guidance about competencies such that independent entities can provide appropriate training. Thus, for example, the Association for Energy Affordability (AEA) and others provide training for certifications of the Building Performance Institute (BPI). It is common, however, for organizations to maintain a separation between their certifying and training divisions and in this way be able to provide training for their own certifications, as is the case with the Association of Energy Engineers (AEE), the Building Operator Certification (BOC) program, and ASHRAE, among others.

Certificates versus Certification. While “Certification” is a relatively high bar, it is easily confused with the much lower bar of “Certificate.” A Certificate is a “certificate of completion” of a course of study or some other measure of skill attainment, from a recognized training or educational provider. It does not endow industry or professional status and is not maintained over time, as by annual re-certifications with continuing education and certification fees. Certificates are also often offered by academic institutions as non-degree programs in a particular specialization that may or may not be part of an advanced degree (typically a Masters) program. Compared to a certification, a certificate is easier to establish and a much more flexible instrument.

Potentially Appropriate Programs. An annotated list of programs, primarily Certification programs, identified as potentially appropriate for NYCHA HPT needs, is provided as Appendix A.2. We do not find any Certification completely matched to HPT needs, although various programs offer specific aspects of value. For example:

- The Building Performance Institute (BPI) Energy Efficient Building Operations (EEBOPS) Certification is relevant, providing an overall view of energy-related system practices in multi-family buildings, as well as the customized AHPT Certification that was developed by AEA and BPI specifically for the NYCHA; AEA maintains an instructional boiler lab and a Passive House lab at its South Bronx facility that could

be useful for specific training;

- The Building Operator Certification (BOC) covers useful topics applying energy efficiency to common equipment operating cases. BOC also offers a Certificate option for its BOC level 1 sequence, for those who do not wish to sit for the Certification exam. BOC can be customized for specific emphasis by the CUNY Building Performance Lab, which represents the BOC for NYC;
- The Building Commissioning Association (BCA) protocols include valuable procedures for existing building systems. However, the training is focused on Certification of Commissioning Authorities, with an emphasis on a formalized commissioning process that is in excess and in the wrong direction for what NYCHA needs in-house for its HPT;
- The Building Owners and Managers Institute (BOMI) is the educational arm of the Building Owners and Managers Association (BOMA). ***BOMI certifications, in a hierarchy of titles, are probably the most widely recognized and respected in the commercial real estate industry; for this reason, it may be of particular value for NYCHA to consider developing a relationship in the longer term.***
- Urban Green Council's GPRO series offers short courses that cover a range of topics relevant to the trades that connect building practices to sustainability. These may best be seen as useful for raising awareness of environmental connections and practices and could be applied usefully across many NYCHA positions (staff titles) beyond the Heating Division.

Private Technical Institutes. We did not review offerings from private technical colleges in the area, of which there are many, such as TCI (Technical Careers Institute). Among the careers covered, many of these career training institutes include a track for HVAC technician, which may be of relevance. Facilities vary and course curricula are not readily made public and are therefore difficult to evaluate. Some of these institutes may offer customized programs for institutional customers. For example, we are aware that the Lincoln Institute, located in New Jersey, has provided a program to Columbia Presbyterian Hospital for its building skilled trades staff, with a reported emphasis on scenario-based learning that carried strong appeal for the customer.

University-based Higher and Continuing Education. Individual degree or non-degree education options may be useful for higher level Heating Division staff. With particular relevance for the long-term management of NYCHA's infrastructures, individuals might wish to pursue studies in the area of IT, Computer Science and Data Analytics. All CUNY campuses and most private universities have Continuing Education programs with offerings in this area. For those seeking to really manage energy for the agency, the Master's Degree Program in Energy Management at the New York Institute of Technology is a unique offering that has been an important professional degree for many individuals in this field. For less advanced individuals starting out in the HPT workforce, the Associates degree in HVAC (Environmental Control Technology) offered at CUNY's NYC College of Technology in downtown Brooklyn may be the most relevant offering available.

The CUNY School of Professional Studies (SPS) is CUNY's centralized continuing education provider (as opposed to separate campus programs). SPS, in collaboration with CUNY BPL, manages for NYC

Department of Citywide Administrative Services (DCAS), an Energy Management Institute that offers courses for NYC agency staff. It could be worthwhile to explore whether use of a similar mechanism in conjunction with the Heating Training Center to update and extend its offerings.

Recommendations

The following recommendations are developed from the findings described in this section:

- **Use Certificates** as a means to recognize completion of courses and/or attainment of specified skills associated with the suggested program of focused heating infrastructure initiatives. Certificates can be flexibly issued by educational or training institutions and can thus be used in conjunction with custom-developed training elements, much more readily than professional certifications.
- **Consider Certifications longer-term as part of developing and defining an HPT career pathway.** Certification of staff by external bodies can be an important part of career development, as well as valuable for NYCHA's representation of its management professionalism. In particular, we recommend exploring a relationship with the Building Owners and Management Institute (BOMI).

4. SUMMARY OF RECOMMENDATIONS

Recommendations are summarized in this section so that all recommendations can be found in one place. They are repeated from section 3 above, where they are presented with the Findings upon which they are based.

- 4.1 Create a clear career development pathway within the HPT title.** (See also 4.8 below.) This should be associated with clear knowledge/skill competencies and milestones that can be tested for and/or observed in records of job performance.
- 4.2 Analyze the drivers of better (less stressed) sites** and use this understanding strategically to begin addressing staff and plant conditions at stressed sites.
- 4.3 Clarify outsourcing policies & practices with the HPT,** including defining a clear HPT role with respect to contractors that establishes such things as rules for contractor access, storage of materials, recording of contractor activities, responsibilities for supervision and sign-off on contractor task completion, etc.
- 4.4 Define data-centric tools and functions for Heating Plant Supervisors.** Such tools and functions can start simply and be gradually built up over time along with skills for data acquisition and use.
- 4.5 Focus HPT work on central plant and building-system level infrastructure.** This likely requires adjustment of HPT work responsibilities with respect to apartment no-heat calls.
- 4.6 Use Work Order (Maximo) data** for both system condition and workforce performance quantification that can show patterns of recurrent failure, repair tasks where specific training is

needed, and individuals who are better and worse at specific procedures.

- 4.7 Develop and implement Key Performance Indicators (KPI)** based on measurement of plant variables that will signal good operation, including energy efficiency. KPI can be rolled out incrementally, in small steps, associated with training/plant improvement initiative, under a rubric of retro-commissioning or ongoing commissioning.
- 4.8 Improve laboratory facilities and hands-on training in the initial training program**, including investment in the Training Center facilities, as well as a review of the curriculum. It may be more effective to have a very firm grounding in a limited set of mechanical/electrical skills/tasks and introduce further content later in HPT's careers.
- 4.9 Adjust Policies for Initial Placements.** Given transition difficulties from classroom to hands-on fieldwork, sites with better operating conditions may provide a more successful first assignment for new HPT. A review of initial assignment policies may reveal improvements that could result in better outcomes.
- 4.10 Formally develop Mentoring Skills and Responsibilities of senior HPT.** While a listed part of the Advanced HPT job description (Appendix A.4 item D.9), logistical challenges make this difficult to implement. Nevertheless, developing on-the-job and mentoring methods and supporting their application is identified as a crucial task for HPT workforce improvement.
- 4.11 Develop an updated list of Competencies, to be required at various stages of career development** that can be achieved over time by continuing education and for which specific tests can be developed, to be associated with internal Certificates. This list can be used to develop specific Learning Objectives for training curricula. Training for identified key competencies and skills may be bolstered by use of new digital media, such as U-Tube lessons.
- 4.12 Introduce scenario-based instruction into classroom activities**, based on typical conditions encountered and in conjunction with training on specific kinds of system/equipment failure modes and diagnosis. Scenario-based instruction simulates field conditions with problem situations that require students to think through their actions, review and discuss them as complement to hands-on skills training.
- 4.13 Develop and deploy a modular approach to training topics that can be associated with improvement campaigns.** The ability to identify specific areas/kinds of failure that are common across heating systems suggests modular treatment by topic. Topics can be addressed sequentially, as improvement initiatives or "campaigns" are rolled out with quantitative baselines and improvement metrics (KPI) established. Training in installation and use of data-loggers would be part of the training for a given improvement initiative. Development of field-accessible resources may also be possible for commonly encountered conditions.
- 4.14 Identify long-term Knowledge Needs and Curriculum for HPT, especially as associated with work**

in digital environments. While mechanical and diagnostic skills dominate current training needs, longer term needs are identified associated with skills for working in a digital environment of controls and data-based performance monitoring. Development of KPI recommended above requires training for HPT, especially senior and supervisory technicians, in their use; address other digital requirements based on industry practices for data availability and use.

4.15 Use Certificates as a means to recognize completion of courses and/or attainment of specified skills associated with the suggested program of focused heating infrastructure initiatives. Certificates can be flexibly issued by educational or training institutions and can thus be used in conjunction with custom-developed training elements much more readily than professional certifications.

4.16 Consider Certifications longer-term as part of developing and defining an HPT career pathway. Certification of staff by external bodies can be an important part of career development, as well as valuable for NYCHA's representation of its management professionalism. In particular we recommend exploring a relationship with BOMI.

5. CONCLUSION

The situation of the HPT workforce is found to be challenging, beset with logistical and morale issues in the face of difficult physical infrastructure conditions. Training can be part of a solution but cannot by itself change the situation. Training for HPT must be planned within an organizational framework that provides a vision for the role and function of the HPT workforce.

Reliance on external training products, especially ones already in place, is an obvious first consideration for addressing workforce training needs. While relevant bits and pieces are found available through existing training programs, no single one was identified that could offer a comprehensive solution to the unique situation of the NYCHA HPT.

We have, therefore, suggested in this assessment a customized training approach that emphasizes a combination of concepts tailored to specific conditions found across NYCHA heating infrastructures:

- retro-commissioning/ongoing commissioning
- serial "improvement campaigns"
- on-the-job mentoring and field-accessible resources
- performance quantification
- articulated competencies linked to career progress

Near-term training attention must be addressed to physical infrastructure challenges and the HPT mechanical skills necessary to address them. We suggest that training, rather than aiming at comprehensive coverage, address one concrete problem area at a time, putting building blocks of knowledge and practice into place, tying improvement of skills to quantifiably demonstrable improvement in plant and operations.

Measurement is an important area of practice to be enhanced, with development and use of Key Performance Indicators (KPI) for each concrete problem area addressed. This is especially important for higher level, supervisory personnel who must track conditions at multiple sites. These individuals will

need training in emergent aspects of digital data acquisition and data analytics. Planning for this training can be, in part, generic but will also have to be coordinated with decisions made about the future of heating plant automation and the specific platforms to be employed.

We hope such an approach can be usefully developed.

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APPENDICES

- A.1 SUGGESTED AREAS OF FOCUS FOR HPT KNOWLEDGE / CURRICULUM DEVELOPMENT
- A.2 CERTIFICATION PROGRAMS CONSIDERED
- A.3 SUMMARY OF FOCUS GROUPS
- A.4 BACKGROUND NYCHA DOCUMENTS

Appendix A.1: Suggested Areas of Focus for HPT Knowledge / Curriculum Development

A “COMMISSIONING APPROACH”: focus on how systems are supposed to operate and what is necessary to get them back to that operating condition. This is the core definition of Retro-Commissioning. Proper operation would be associated with quantitative KPI (Key Performance Indicators). A sample of possible focal areas is briefly provided below. HPT classes would identify through discussion relevant ongoing conditions at sites, would provide trackable action steps, and the necessary understanding to implement KPI measurement over time (an “ongoing commissioning” approach).

A. Review No-Heat Complaints for causation in terms of distribution system components and functions. Hierarchical structure for troubleshooting, starting with other complaints and known system conditions.

Focus on:

1. Steam trap function and diagnosis
2. Vacuum pump function and diagnosis
3. Impacts of leakage and other conditions in aging piping
4. KPI to apply for No-Heat complaints and success of diagnostic procedures

Development of this curricular module might be usefully associated with a study of Heat Complaints and their resolution based on existing Work Order records.

B. Vacuum Pump Failure: Troubleshooting and Root Cause Analysis. A systematic approach to field diagnosis of vacuum pump failure and correction of system-level conditions that lead to failure.

1. Failure due to high condensate temperature
2. Causes of high condensate temperature, including steam trap and zone valve functions
3. Diagnosis and corrective steps; work and reporting procedure.
4. Condensate return monitoring with hand-held instruments and data-loggers
5. KPI for condensate temperatures and vacuum pump failures

Development of this curricular module would be associated with a review of vacuum pump conditions as reported by HPT staff and supervisors and as reflected in Work Orders. Frequency of failure would be developed for statistical baseline.

C. Fresh Water Additions to the Heating System. Review why minimizing fresh water additions is so critical – to operating costs, equipment life and energy efficiency.

Focus on:

1. Where and why water may be added to the heating system
2. Metering, recording, evaluating, reporting on water additions
3. What to do when encountering various kinds of leakage situations
4. Tracking leakage and fresh-water addition KPI

This module would examine various cases of excess water additions.

D. Monitoring and Adjusting Boiler Plant for Efficiency. Review of factors that drive boiler plant efficiency, in particular boiler control and cycling.

Focus on:

1. Recording operating patterns (use of simple data-loggers or CHAS readings)
2. Boiler control and control adjustment in multiple boiler plants
3. Stack temperatures, burner modulation and combustion efficiency
4. KPI baseline and improvement tracking through trial adjustments

This module could be associated with new forms of data acquisition and tracking to be procedurally implemented.

Appendix A.2: Certification Programs Considered

BCA

The Building Commissioning Association is the national professional body for the emerging field of Commissioning. Its main focus is on the professionalization and professional credentialing of individuals who oversee the commissioning of buildings, via its Certification product:

- Certified Commissioning Professional

While there is a large amount of valuable information on the commissioning process for existing buildings available on the BCA website, the Certification and associated training is aimed at adherence to a formalized commissioning process based on design documents and a construction project.

UGC

The NYC-based Urban Green Council offers G-Pro, a series of courses each with associated Certificate. The short courses (1 – 2 days) relate environmental issues to building trades practices and developing trends. They may best be seen as quick, effective ways of raising awareness. The present offerings include:

- Fundamentals of Building Green
- Construction Management
- Mechanical
- Plumbing
- Electrical Systems
- Operations & Maintenance Essentials

BOMI

The Building Owners and Managers Institute (BOMI) is the national educational division of the Building Owners and Managers Association (**BOMA**). They offer several certifications to address different levels and specialties within the real estate management industry:

- Real Property Manager (RPM)
- Facilities Management Administrator (FMA)
- Systems Maintenance Technician (SMT)
- Systems Maintenance Administrator (SMA)

These certifications are widely recognized by the property management industry, often play a role in career advancement, and might be thought of as the “gold standard” for this market. Courses can be pursued through self-study, semester-length offerings at local BOMA chapters, accelerated review formats, or specially arranged on-site. The new employee mandatory courses at the Operating Engineers Local 94 Training Center bear credit towards the SMT and SMA certifications. Significantly, maintenance of BOMI Certifications requires ongoing earning of approved Continuing Education Units (CEU’s).

In recognition of industry attention to Sustainability, BOMI has recently introduced a category and course of study for “Sustainability Manager.”

USGBC

The United State Green Building Council promotes and administers a single professional certification:

- LEED Accredited Professional (AP)

LEED (Leadership in Environmental Excellence in Design) is the most widely recognized “green building” standard. Individuals are certified in the LEED rating system and application process for obtaining LEED designations for building projects. Individuals may self-study, can attend seminars and/or can join study groups, sometimes offered through local USGBC chapters. While originally oriented towards new building design, a program for existing buildings, LEED-EB has been released and recently revised, emphasizing O&M practices.

The New York Chapter of the USGBC became interested in communicating the key, relevant aspects of sustainability to the construction trades. The Chapter independently incorporated as the Urban Green Council and developed its GPRO series introducing basic knowledge of emerging green technologies and practices to a wide trades audience (see UGC, above).

AEE

The Association of Energy Engineers offers a large variety of certification titles, with a particular focus on energy performance and sustainability topics, such as

- Certified Energy Manager (CEM), original and flagship certification
- Certified Lighting Efficiency Professional
- Certified Power Quality Professional
- Certified Indoor Air Quality Professional
- Distributed Generation Certified Professional

Certification is achieved by testing, usually following a course of study that can be pursued via seminar, on-line course, or self-study. These certifications are recognized in the utility industry, by the US Department of Energy but less so in the real estate management industry. AEE certifications take particular aim at energy performance and sustainability knowledge.

ASHRAE

The Association of Heating Refrigeration and Air-conditioning Engineers has for decades been the ruling authority in the US on HVAC design. With its recent focus on the actual performance of buildings, ASHRAE has developed several certifications for high-performance designers and is developing one specifically for personnel involved in building operations:

- Operations and Performance Management Professional (OPMP)

Certification will be based on a test, with a combination of education and work experience required to sit for the exam. The focus is on knowledge of and ability to manage energy and indoor environmental quality. There is presently no training offered directly by ASHRAE in connection with its Certifications although other ASHRAE training and self-study programs would be relevant to work in this field.

IFMA

The International Facilities Management Association provides professional development courses, both on-line and in-classroom, and also two levels of certification:

- Certified Facility Manager (CFM)
- Facility Management Professional

On its website IFMA provides a short list of university-based continuing education certifications in Facilities Management (but not including the program at CUNY's NYC College of Technology). Another organization,

BOC

The trademarked "Building Operator Certification" is managed by a non-profit of the same name. Created by the Northwest Energy Efficiency Alliance and the Northwest Energy Efficiency Partnership in the late 1990's, it has grown as a nationally-offered program focused on **commercial real estate** and has been most commonly supported by utility sponsors (although not in NYC).

- Building Operator Certification level I and level II

Certification is offered as a direct outcome of participation in a training program that combines classroom sessions and practical field exercises. Focus is on energy and resource efficient operation and maintenance of building systems earned, for each level by (a) attending 8 days of training over 3 months (b) completing 5 project assignments in their facilities, (c) passing class exams and (d) having appropriate work experience. Most recently, BOC has determined that it's **BOC level 1 will be available as a Certificate**, for those who do not wish to sit for the certification exam.

This curriculum has been supported in NYS by NYSEDA, especially for use in school districts. In NYC, this certification is offered through CUNY under coordination of the Building Performance Lab. The BOC classes are recognized as approved CEU's for maintenance of BOC certifications.

BPI

The Building Performance Institute, located outside of Albany and supported by NYSEDA since its inception in the mid-1990's, provides standards for knowledge and skills in the **residential energy retrofit market** including weatherization programs and multifamily housing.

- Energy Analyst I and II
- Residential Retrofit Specialist
- Multifamily Energy Analyst
- Energy Efficient Building Operations (multifamily)

BPI does not provide training but encourages others to train to its standards and provides certification tests and testing services. Locally, such training is provided by several not-for-profit organizations: the Association for Energy Affordability (AEA), Conservation Services Group (CSG), the Community Environmental Center (CEC) and one A/E firm, Steven Winter Associates. BPI-certification training is also provided with NYSEDA support through community colleges across the state, coordinated by Hudson Valley CC and in NYC through CUNY under coordination by Bronx CC.

NATE

The National Association for Technical Excellence provides a range of certification standards aimed primarily at the installation and service trades. NATE establishes the body of knowledge and tests for its various titles and approves local entities to act as trainers.

APPA

Originally the Association of Physical Plant Administrators, APPA focuses on educational facilities and campuses, including a new certification title with two levels

- Educational Facilities Professional
- Certified Educational Facilities Professional

AFE

The Association for Facilities Engineering offers several levels of certification:

- Certified Plant Engineer
- Certified Plant Maintenance Manager
- Certified Plant Supervisor

These certifications are aimed at graduate engineers or non-engineers with extensive in-plant experience. A national exam is administered, preparation for which largely appears to be on a self-study basis using AFE-prepared materials.

While an interesting reference point, this certification is targeted at industrial rather than commercial or institutional facilities and appears to have little presence in the NY Metropolitan area market.

Appendix A.3: Summary of Focus Groups

Record of NYCHA HPT Focus Groups

Prepared by Glenn Phillips, 2/2/17

On January 20, BPL conducted two focus groups with HPTs and their supervisors. The first group consisted of eleven HPTs from all five boroughs with a range of experience from one year to over 35 years in the title. The second group, consisted of nine people, primarily supervisors all with over 10 years of experience. The focus groups were facilitated by Michael Bobker, Director CUNY BPL, and were observed and recorded by two BPL staff.

Both groups had a similar perception of the issues facing HPT and the management of heating plants at NYCHA. Underlying both discussions was a frustration over staff reductions and turnovers which have led to safety issues, reduced hands-on mentoring, and reduced preventative maintenance.

One participant, working in a unit that had been specially assembled to address a problematic facility, shared that they had eliminated a backlog of complaints, and moved to a more proactive, preventative maintenance program. His supervisor reported that the success at that location had come at the expense of other locations which are now more understaffed than they had been.

Ongoing training, both through refresher courses and mentoring in the field, was perceived as a high priority by both groups. HPTs identified needs for more hands-on training in regards to

- Mechanical skills - seals and motors
- Electrical skills
- Diagnostic skills
- Tool use - especially meters and electrical tools
- Written communication
- Team work

The supervisors also indicated a need for more detailed training in new equipment. The lack of staff trained to properly manage linkageless boiler systems was specifically mentioned. Both supervisors and HPTs acknowledged that ongoing mentoring varied significantly between clusters, with Queens and Staten Island especially seeming to have a better reputation. Supervisors suggested that greater staff stability in these regions contributes to better mentoring. Supervisors also hoped that more training could be completed during probationary period so that incompetents could be weeded out, a sentiment echoed by more seasoned HPTs, who expressed concerns about uneven abilities in their colleagues. The possibility of using summertime boiler overhauls as a training opportunity was mentioned.

Both groups expressed the difficulty in addressing basic infrastructure system problems and preventative maintenance because of interruptions from “code 7” work orders for issues in apartments, in the face of much reduced staff. Both HPTs and their supervisors expressed a desire for their work to be driven by a core understanding of the equipment and its needs, rather than rushing through a minimal safety check and spending the bulk of their time addressing complaints.

Some supervisory issues were mentioned, including a lack of clarity in work processes, such as proper

use of handhelds for tracking work orders, prioritization of work orders, coordination with maintenance staff, working with external contractors, and completion of repairs that require multiple trades. Other related issues include a need to improve mentoring skills.

From both groups, comments about the quality of equipment were varied, with some reporting that heating plant equipment was generally in good condition, while others reported that equipment was nearing the end of (or was already well beyond) its useful life. Participants in the first group commented that other (non-heating) equipment also regularly causes problems for the heating equipment, including sewage overflows. Overall, supervisors felt that problems with building leakage, pumps, and vacuum systems were responsible for most of the inefficiencies in the system, HPT's agreed that the boilers weren't the problem, and found more problems upstream, including convectors. Both groups reported that getting spare parts was challenging, and that delays of two or three weeks were not unusual.

Both groups expressed concerns that worker safety has been compromised both by staff reductions and by staff experience and training. HPT's cited workplace injuries and near-misses resulting from improperly trained or incompetent staff or from simply not having enough people to properly manage the repair. Supervisors expressed that they were often unwilling to take the steps to remove incompetent staff because of fears that the staff would not be replaced.

Both groups felt that the use of outside contractors was problematic and of inconsistent quality. Water treatment, pumps and vacuum tank work are routinely outsourced, as well as boiler overhauls on occasion. That only a few companies are certified to work with NYCHA heating plants can create pinchpoints (tank welding with only a single provider was the prime example).

HPT Training Assessment – Focus Group Outline

The following outlines a plan for Focus Group discussions with HPT and supervisors. Two groups are planned, three hours each. There are three general areas of discussion suggested, with 50 min. allocated for each and short breaks between. The bullets under each of topic-areas (1), (2) and (3) represent the kinds of questions that would be asked to initiate and steer the conversation. Not all bullet point questions will necessarily be asked – there are multiple questions around similar topics to help the moderator keep the discussion flowing. The questions may be varied somewhat between the morning and afternoon groups, as they will differ in level of experience and seniority.

Please review the outline and provide feedback, with an eye especially to any topics you feel should be covered that are missing, should be emphasized or things you would prefer not be asked.

(1) Perception of NYCHA Heating Plants

- Briefly describe the heating plants in which you work – major equipment and conditions
- Briefly describe *your perceptions* of the heating plants in which you work
 - Are they generally in good condition? Are there specific areas of concern?
 - What is one thing that you notice about operation of the heating plants?
 - Are you confident about your understanding of the system controls and your ability to adjust them for good operation? Do you have a clear picture of what constitutes “good operation”? How would you describe it?

- How would you describe your engagement with the plants -- very active? Only in certain respects? Limited? Hands-off except for work orders?

(2) Perception of the Job

- Describe the HPT position in terms of activities.
 - Where does most of the work occur?
 - What is the primary activity? Secondary?
 - Are there observations that you make, gauges that you read on a daily basis? What do they mean to you? Do you record readings, observations in a log?
 - What routine inspection and maintenance duties do you perform outside of repair work orders?
- What are the most important skills for the job? Are there certain tasks that you find challenging because of lack of certain specific skills?
- Has the job been changing over time? If so, how?
- What is your level of satisfaction with the HPT job?
 - Compare to your original expectations
 - What could make your work more effective
 - Do you feel your capabilities are being fully utilized? If not, what suggestions?
 - Do you see opportunities, pathways for growth and development

(3) Perception of Training and Preparation for the Job

- Did your initial training give you appropriate preparation for the work? Are there gaps that you see after working for a while?
- Has what you learned in the initial training “stuck”? Do you feel a need for periodic “refresher” learning?
- Are there specific things that you feel you need to learn more about, that you need more training on?
- Are you able to learn effectively on the job? How does that occur or not occur?
- What areas of heating plant technology do you feel are gaps in your knowledge/skill

HPT Training Assessment – Focus Group Participants

Last Name ▾	First Name ▾	Title ▾	Borough ▾	Cluster ▾	Supervisor ▾	9am-nc ▾	1pm - 4pm ▾
Acevedo	Marco	Resident Buildings Superintendent	Heating	Special Teams	Michael Iezza		X
Alvarado	Tiffany	Heating Plant Technician (HA)	Brooklyn	3	Darragh Johnson / Christopher Howard	X	
Cannon	Mathew	Heating Plant Technician (HA)	Manhattan	OPMOM	Ariel Pascual / Edward Gomez	X	
Charles	Godfrey	Resident Buildings Superintendent	Heating	Special Teams	Michael Iezza		X
Collins	Devon	Assistant Resident Buildings Superintendent	Brooklyn	3	Anthony Picciano		X
Collins	Tyrek	Heating Plant Technician (HA)	Queens	2	Vacant / Marlon Wood	X	
Colon	Victor	Heating Plant Technician (HA)	Bronx	1	Christian Grullon / Nicholas Williams	X	
Dominguez	Jose	Heating Plant Technician (HA)	Staten Island	3	Israel Tirado / Mike Tirrell	X	
Figueroa	Tricia	Heating Plant Technician (HA)	Bronx	2	German Diaz / Donald Beard	X	
Footman	Louis	Heating Plant Technician (HA)	Brooklyn	OPMOM	Craig Williams / Lamark Vaughn	X	
Freeman	Sudari	Resident Buildings Superintendent	Brooklyn	1	Earl Roberts		X
Gonzalez	Steven	Resident Buildings Superintendent	Manhattan	3	Kenneth Jones		X
Grullon	Christian	Resident Buildings Superintendent	Bronx	1	Keevin Wells		X
Jordan	Jermaine	Resident Buildings Superintendent	Brooklyn	4	Sherraine Wingate		X
Kearse	Damarcia	Heating Plant Technician - Advanced (HA)	Brooklyn	4	Jermaine Jordan / Vacant	X	
Moody	Eric	Heating Plant Technician (HA)	Manhattan	1	Anthony Rivera / James Smith	X	
Perez	Radames	Heating Plant Technician - Advanced (HA)	Manhattan	1	Anthony Rivera / James Smith		X
Pile	Sarita	Heating Plant Technician (HA)	Brooklyn	4	Jermaine Jordan / Vacant	X	
Rahming	Sarah	Heating Plant Technician (HA)	Bronx	2	German Diaz / Donald Beard		X
Reese	Paul	Assistant Resident Buildings Superintendent	Queens	1	Howard Johnson		X
Spencer	Jerome	Heating Plant Technician - Advanced (HA)	Brooklyn	4	Jermaine Jordan / Vacant		X
Thorpe	Nelson	Heating Plant Technician - Advanced (HA)	Manhattan	1	Anthony Rivera / James Smith	X	
Viera	Maria	Heating Plant Technician (HA)	Bronx	3	Ismael Cruz / Roy Weston	X	
Weston	Roy	Assistant Resident Buildings Superintendent	Bronx	3	Ismael Cruz		X

Appendix A.4: Background NYCHA Documents

Background documents:

A.4.1 Advanced HPT and HPT Maintenance Work Job Descriptions from the NYCHA Standard Procedures Manual

A.4.2 Newly-Appointed HPT Course Outline

A.4.3 Advanced HPT Training Program (Agreement with AEA/BPI)

A.4.4 NYCHA Fireman's Guide (1982) Table of Contents

Appendix A.4.1
Advanced HPT and HPT Maintenance Work Job Descriptions
from the NYCHA Standard Procedures Manual (PDF)

NYCHA STANDARD PROCEDURE MANUAL

- If the system is not operating properly, contacts the Energy Department, Emergency Services Department, and the Heating Superintendent to initiate the repair process

25. Performs monthly test of Sensaphone System in non-CHAS heating plants

- Calls the assigned telephone number
- Listens for the recorded message
 - If the system is not operating properly, contacts Emergency Services Department and the Heating Superintendent to initiate the repair process

D. Advanced Heating Plant Technician (A-HPT)

A-HPT travels throughout their assigned developments and performs the following duties and related work under the direct supervision of the Heating Assistant Superintendent:

1. Should possess a P-99 Certificate of Fitness for Low-Pressure Oil Boilers
2. Must use air respirators, when necessary, and pass a physical test-fit for the facemask. Swipes-in, at the development designated by the Heating Assistant Superintendent (as the first location to be visited)
3. Reviews all outstanding work orders or problems reported at the location with the HPT
4. Is responsible for maintaining and performing repairs on all heating related equipment
5. Has overall responsibility for establishing and maintaining the safe and efficient operation of all heat generating systems and associated equipment in their assigned cluster
6. Ensures that the CHAS equipment is in place and functioning in all CHAS enabled heating plants. Informs development Superintendent if any components of the system have been tampered with or are missing
7. Contacts the Heating Assistant Superintendent whenever repairs require additional resources, or when unable to correct the problem
8. Reviews all tests, readings, logs and reports
9. Assists and trains HPTs on necessary techniques
10. Periodically conducts basic tests to confirm results obtained by HPT
11. Observes the monthly Remote Safety Switch (ASCO) test; signs the daily log

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NYCHA STANDARD PROCEDURE MANUAL

12. Ensures that the weekly test of dual fuel boilers is performed and periodically observes the performance of the test
 13. Reviews the feedwater analysis and all related tests/reports
 14. Ensures that there are adequate supplies and makes recommendations to the Heating Assistant Superintendent as to what is needed
- E. Heating Plant Technician (HPT)/Heating Maintenance Workers
1. Should possess a P-99 Certificate of Fitness for Low-Pressure Oil Boilers
 2. HPT or maintenance workers that perform inspections or maintenance on boilers with Fixed Air Compressors must also possess a G-35 *Certificate of Fitness to Operate Air Compressors*
 3. HPTs and maintenance workers must use air respirators, when necessary and must pass a physical test-fit for the facemask
 4. Works under the direct supervision of the Heating Assistant Superintendent
 5. Immediately reports to the development Superintendent's Office, checks for work orders and any additional work requested by the Heating Department or development Management. Picks up work orders:
 - Four (4) times a day during the heating season
 - A minimum of twice a day during the non-heating season
 6. Daily checks all centrally located CHAS equipment to ensure that the equipment is in place and functioning. Informs the development Superintendent if any components of the system have been tampered with or are missing
 7. Visits apartments and addresses heat complaints
 - For every complaint regarding heat or hot water that is received during the heating season, the following readings must be taken in the apartment and logged on the related order:
 - Ambient temperature
 - Hot water temperature
 8. Maintains janitorial standards in all heating related areas
 9. Is responsible for maintaining and repairing all heat related equipment
 10. Inspects the heating plant and reviews and signs all logbooks, reports and/or forms

NYCHA STANDARD PROCEDURE MANUAL

11. Performs daily oil tank stick reading:
 - Must be completed at the same time each day
 - Initiates order for oil, if required
 - Enters results in the daily log
 - Receives and inspects fuel deliveries
12. Maintains a daily log of steam meter readings (For all heating plants that are supplied steam by a utility company)
13. Performs safety tests:
 - At the beginning of each shift
 - When boilers are restored to service, and records all results after each test in the Boiler Room Logbooks
14. Ensures that all boiler safety devices are operating properly at all times: At no time is any safety device to be circumvented from its normal operations
15. If problems occur with any safety device, notifies the Heating Assistant Superintendent, and the development Superintendent immediately and records all problems in the Logbook, in red ink
16. Performs visual inspections on all safety devices daily and records results in the Boiler Room Logbook
17. Inspects and lubricates all machinery and equipment, in accordance with established schedules; logs all preventive maintenance measures in the Boiler Room and Preventive Maintenance Logbooks and on NYCHA Forms 060.072, *Mechanical Equipment Record*, and 060.035, *Boiler Room Daily Report*
18. Performs the Daily Flue Gas Analysis on all boilers that are in operation and enters results in the Boiler Room Logbook and on NYCHA Form 060.035, *Boiler Room Daily Report*.
19. Maintains the boiler emissions within a carbon dioxide (CO₂) range of 8% to 9.5% for gas and 10% to 12.5% for #2 grade oil
20. Performs feedwater analysis once a day on all operating boilers, records results and recommended dosages on NYCHA Form 060.175, *Boiler Feedwater Analysis*, reports in the *Boiler Room Daily Report* if treatment was given or not
21. Inspects all Tank Rooms and CHAS components, if present, a minimum of twice weekly, or as directed by the Heating Assistant Superintendent

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Revised 5/25/16

NYCHA STANDARD PROCEDURE MANUAL

22. Completes all associated NYCHA forms, including:

- NYCHA Form 060.073, *Twice-Weekly Tank Room Inspection Report* – inspected twice weekly, submitted weekly
- NYCHA Form 060.074, *Tank Room Log* – inspected twice weekly, submitted monthly. Performs any minor repairs or maintenance, as needed
- Each hot water storage tank is given a bottom blowdown on the first Monday of each month. This is reported on the monthly NYCHA Form 060.074, *Tank Room Log*, more often if necessary, to remove sediment and foreign matter

23. Performs the monthly Remote Safety Switch (ASCO) test. Enters the date and results of the test on NYCHA Form 060.035, *Boiler Room Daily Report*, and in the back of the Boiler Room Logbook

24. Performs the weekly test of all dual fuel boilers for four (4) continuous hours, on Tuesdays, if the development has dual fuel operating capabilities, refer to Section XVIII., page 45, *Dual (interruptible) Fuel Developments*

- All boilers are to run on oil only during the test period
- If a holiday falls on a Tuesday, the test is performed on the next business day
- Test results are recorded in the Boiler Room Logbook and on NYCHA Form 060.035, *Boiler Room Daily Report*
- Any problems with boiler operation discovered during testing must be brought to the Assistant Heating Superintendent's attention immediately

25. Completes and submits to the Development Office completed NYCHA Forms 060.035, *Boiler Room Daily Report* and 060.175, *Boiler Feedwater Analysis*, and other required reports. The Development Office forwards these forms (via fax, or emailed scanned copy) to the Heating Assistant Superintendent

- Originals are filed at the Development Office in the Development Heating Folder

26. Maintains and updates development NYS-DEC Folders. For more information on the contents of this folder, see page 107

- Provides copies to the Development Office and forward originals to the Heating Department for placement in the NYS-DEC Folder, as required

<p>NOTE: Copies of all NYS-DEC documents related to the Heating Department and Developments should be maintained in the PHAS folder and kept in the Housing Manager's office.</p>
--

NYCHA STANDARD PROCEDURE MANUAL

27. Reports any unusual condition to the Heating Assistant Superintendent and logs in the Boiler Room Log. Unsafe conditions must not be left unattended
28. Contacts the Heating Assistant Superintendent if assistance for repairs or maintenance is required
29. Informs the Heating Assistant Superintendent of any inoperative boilers in the plant immediately after the boiler is taken offline
30. Checks Sump pumps in the boiler room daily and records the results in the Boiler Room log

NOTE: Emergency Services Department must be notified of any bypasses left open after 4:00 P.M.

NOTE: Technical support is provided by the Professional Development and Training Unit personnel, upon request.

VII. EMERGENCY SERVICES DEPARTMENT (ESD)

A. Responsibilities

1. Heating Plant Coverage

Emergency Services Department monitors and responds to heating plant concerns and alarm notifications from:

- 4:00 P.M. to 8:00 A.M., Monday through Friday
- 24 hour operation on weekends and holidays

NOTE: During the above coverage times, all heating staff report to and are under direct supervision by Emergency Services Department.

2. Responses to Heat and Hot Water Complaints/Concerns

- Monitors CHAS and determines if any heating complaints can be addressed via CHAS. If any changes are made, informs Heating Administrator via email
- Dispatches Heating Department Roving Teams, as needed, if heat complaints cannot be addressed via CHAS
- Responsible for all Roving Teams

Appendix A.4.2
Newly-Appointed Heating Plant Technician Course Outline
27 Days of Various Heating Related Subjects, Standard
Procedures and Job Description (as Per Housing Authority)

- Day 1: Welcome and introduction.
(am) Student history and job positions in H.A.
Time in current position as a HPT
Rules of the training facility, subject to change at training staff discretion.
Facility tour of various training rooms and tankroom and boilerroom.
- Day 1: Further and specific coverage of H.A. rules and regulations regarding Time and Attendance,
(pm) Breaktime, Uniforms, Sexual Harrasment and Workplace Violence Prevention, PPE, and HR information (as time will allow before exam). Before end of day a 110 question heating related exam given to assess student retention of past training from either Local 237 training course or other college heating/boiler course.
- Day 2: Finish coverage of specific H.A. rules and regulations. Then Tankroom training session. This training session becomes a daily routine for as long as students are in attendance during the course. It is a first assignment in the morning routine. Tankroom sheets filled by students will be checked. Explanation of purpose of tankroom inspections and components will encompass the rest of the day.
- Day 3: Boiler Room Daily Report – begin full coverage of daily report, proper filling and explanation in detail of each boxed item and expected comments that the daily report requires. Safetis and testing of such are covered. All day session.
- Day 4: Boiler Room Daily Report – continue full coverage of daily report. (Exam of subject matter covered)
- Day 5: Boiler plant visit for application of Boiler Room Daily Report training session. Class will fill out report as hpts in this plant, are instructed to check oil levels in fuel oil tanks, record information, record gas meter information and become familiar with the plant and its equipment. Specific instructions as to where reading are acquired and noted.
- Day 6: Certificate of Fitness information for P-99 and A-35 is handed out to students for exams to prep them for Fire Dept. exams. C of F are required of HPTs within the first 6 months of employment. Then a 5-day fuel oil and gas consumption excercise is simulated using the Daily Boiler Room Reports for proper fuel oil delivery acceptance, logging and consumption calculation, fuel oil remediation procedures, and proper use of oil equipment.
- Day 7: Finish 5-day fuel oil session. (homework to be given repeating another 5 day exercise). Depending on rest of day timing either operations and individual student boiler room problems are discussed or Mechanical Equipment Cards session is conducted and application of session is conducted in the hand's on training room with actual mechanical equipment.
- Day 8: Hand's on room for application of readings on daily report due to the different panels in boiler rooms. Basic explanation of different burners and what the HPTs are to look for in the way of readings and testing on the burners. Compare the different components on different burners that perform the same function. All day for various students in different boiler plants.
- Day 9: Boiler Feedwater Testing and Analysis – since this is an immediate HPT work requirement the full session of proper testing and treatment is conducted. Proper information on Boiler Feedwater Analysis form is demonstrated. Water samples are derived from the boiler room and step by step testing procedure is done. Step by step procedure is handed out so they can follow in their plants as instructed. (Test next day is given on subject).

- Day 10: Confined Space – full day session covering proper permit required confined spaces procedures, air monitor use and proper filling of permit form. Emphasis on strict adherence to the procedure. Students are required to then enter a confined space in tankroom or boiler room for simulation and determining who is physically able to enter space. (test on subject matter is given).
- Day 11: Question and answer a.m. session for various situations in boiler plant and tankroom. Application to the a.m. session conducted in p.m. and/or boiler plant visit for application to a.m. discussion, or brief electrical instructions given on how to test for fuses and for line current. (Quiz given on tankroom inspections)
- Day 12: Gas Train – Full coverage of gas train, safeties, gauges and application to the connected burner. Hand's on room and boiler room visit for application is conducted. (Exam on subject matter is given).
- Day 13: Gordon Piatt Burner – full day session is conducted on burner due to test requirement. Operation, parts and its boiler room application is conducted along with hands on room mock-up review. (Exam on subject matter is given).
- Day 14: Videos: Fireside and Waterside videos are shown, followed by individual exams related to the videos. Then a 30 Gauge test is given on identifying various gauges connected to the various heating equipment in the boiler plants and tankrooms, much needed due to their inability to properly read gauges.
- Day 15: Exams for P-99 and A-35 are given. Rooftank procedures and operations are reviewed and the changes the H.A. has made as it pertains to the HPT.
- Day 16: Midterm Exam – where applicable to determine status of knowledge and mentality of students. Exam may vary depending on material covered as far. Discussion/review of exam follows.
- Day 17: Steam Heating Systems – review of steam distribution systems in the H.A; its components, controls and how heat is distributed to the residential buildings. Apartment heat complaints disposition and annual overhaul are covered as well as steam traps. Hands on include tankroom visits and steam trap overhaul.
- Day 18: Continuation of Steam Heating Systems (Exam on subject matter is given).
- Day 19: Vacuum Systems – review of vacuum tanks and pumps, their application to the H.A. steam distribution systems and understanding the concept of vacuum. Different models of vacuum tanks are covered, functions of components and how they work. (Exam on subject matter is given).
- Day 20: Vacuum Pumps: - Mechanical seals and packing replacement are conducted, reasons for pump problems, properly dismantling pumps and wiring of such.
- Day 21: Hydronics Systems – review of hydronics information as it relates to the H.A. plants, safeties and component, their function and operation. (exam on subject matter is given).
- Day 22: Hot water Generation – full day review of hot water generation, domestic hot water distribution, component functions and troubleshooting. (exam on subject matter is given).
- Day 23: Instantaneous Hot Water Heaters – an immediate work requirement of the HPT, full session on the function, operation, troubleshooting and maintenance of this equipment. How to use the gauges to evaluate the function of this equipment. (exam on subject matter is given).
- Day 24: Review – exams given and discussion for full day
- Day 25: Review – last boiler plant visit
- Day 26: Written Test
- Day 27: Practical Exam in boiler room - Practical recording fuel oil measurements entering information into daily report

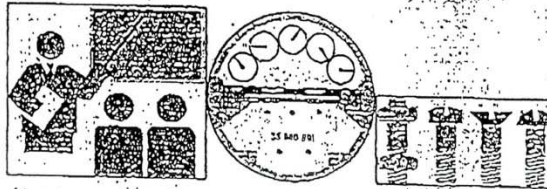
SHEEPSHEAD HEATING TRAINING CENTER
PROFESSIONAL DEVELOPMENT AND TRAINING – 6/2015

Appendix A.4.3
Advanced HPT Training Program (Agreement with AEA/BPI) (1998)

Attention!

Heating Plant Technicians
With 2 Years Experience!

TRAIN
FOR
ASSIGNMENT
AS A
BUILDING PERFORMANCE INSTITUTE
CERTIFIED
ADVANCED
HEATING PLANT TECHNICIAN



◊ Learn Skills
That Prepare You To Be An
Advanced Heating Plant Technician as
Certified by the
Building Performance Institute

◊ Earn a \$3,500 Per Annum Assignment Differential

Interested?

Submit Application Form to the Staff Development Department
by

July 31, 1998!

WHAT IS THE ADVANCED HEATING PLANT TECHNICIAN TRAINING PROGRAM?

The New York City Housing Authority is pleased to announce a new career development and training initiative, to be known as the "ADVANCED HEATING PLANT TECHNICIAN TRAINING PROGRAM." This program was developed in operation with Teamsters' Local 237, IBT. The program will provide 50 selected Heating Plant Technicians (in two separate groups, each composed of 25 employees) with the practical skills and technical knowledge to become certified by the Building Performance Institute (BPI) as a qualified technician for large boiler plants and to serve, upon certification, as an Advanced Heating Plant Technician. The Department of Staff Development will conduct a 14-week training program in two parallel 7-week phases, each week consisting of 2 days of training at the Sheepshead/Norstrand Training facility and 3 days of practical, on-the-job assignments. The first phase will concentrate on basic heating plant operations and knowledge; the second will address more advanced topics and plant troubleshooting. Each segment or module will progress through graduated levels of complexity and difficulty. Sessions will cover:

- Phase 1:
(Orientation & preparation)
1. Orientation
 2. Boilers
 3. Feedwater
 4. Condensate Tank
 5. Fuel Oil Supply
 6. Burners
 7. Steam Distribution
 8. Domestic Hot Water
 9. Heat Complaints
 10. Air Pollution
 11. Energy Mgt. Controls
 12. Safety Fundamentals

- Phase 2:
(On-the-job application)
1. Oil Handling Systems
 2. Gas Systems
 3. Steam Diagnostic Basics
 4. Burner Repair/Overhaul

3. Electrical Systems
4. Combustion Testing, Science & Chemistry
7. Domestic Hot Water & Hydronic Heating System
(End of program)

While in the training phase, participants will continue to receive their regular Heating Plant Technician salary.

Upon successful completion of the program, participants must pass a certification examination consisting of both written and practical components. Those who pass will be issued a Building Performance Institute Certificate for "Mechanic: Large Boiler Plant" and thereafter be eligible for a higher-level assignment to a Borough to serve as an Advanced Heating Plant Technician. Those that are selected for these assignments will be designated as Heating Plant Technician "A" and receive additional compensation by means of a \$3,500 per annum assignment differential.

AM I ELIGIBLE TO APPLY FOR THE PROGRAM?

If you are currently in the Heating Plant Technician title, you may apply for the training program. If you have:

- completed two (2) years as a Heating Plant Technician by July 31, 1998; and
- a satisfactory work history, including time and attendance.

HOW DO I MEET THE PROGRAM ENTRY REQUIREMENTS?

All applicants will be required to take a written, pass/fail pre-qualifying examination, which will have questions to survey the following areas:

- Mechanical Aptitude

Those who achieve above the cutoff score on the written examination will be ranked and considered based upon the following:

- Title Seniority
- Work Record

From this process will be selected the 50 participants to be enrolled in the program.

HOW DO I APPLY?

If you are currently serving in the title Heating Plant Technician (H.A.) and have at least two (2) years of satisfactory experience in title (either civil service or provisional) you may apply. The Authority is seeking motivated applicants who are willing to study and learn new skills. Applicants should be determined to complete the training program. If you are interested in this advancement opportunity, COMPLETE THE APPLICATION attached to this announcement and return it to:

New York City Housing Authority
Staff Development Department
250 Broadway, Room 2602
New York, New York 10007

ALL APPLICATIONS
MUST BE SUBMITTED
NO LATER THAN
JULY 31, 1998



ASSOCIATION FOR
ENERGY AFFORDABILITY, INC.

505 Eighth Avenue, Suite 1801 • New York, NY 10018
Telephone (212) 279-3902 • Fax (212) 279-5306

April 10, 1998

Mr. William Steinmann
Director, Energy Department
New York City Housing Authority
250 Broadway
New York, N.Y. 10007

Dear Mr. Steinmann:

As you know, following up on our meeting of March 27 on certification of NYCHA heating system technical staff, Andy Padian of my staff and the Housing Authority's Staff Development people met for several hours last Friday at the Sheepshead Bay training center to move the process forward. As I understand it, together they developed both a curriculum and a process toward the goal of beginning to create an "elite" group of Heating Plant Technicians (HPT) that will eventually be given the opportunity to become designated by the NYCHA and the City as HPT-II. I feel that the product that they have jointly produced is a tremendous leap in a short period of time, and works within the framework that the Building Performance Institute (BPI) demands in the level of quality for its certifications.

It is important to keep in mind up front that we are embarking on a joint venture that represents something new for both NYCHA and BPI, and as such, title and certification names, training times and duration, and certification schedules should be seen as tentative. I understand that NYCHA's Staff Development people assisted on many of the technical and personnel nuances in order to make this work, and all of us need to take that same "can do" initiative in order to get this NYCHA training and BPI certification process rolling.

There appear to be concerns from some parties about the best selection criteria to use whittle down the 800 HPT's to 350 that meet certain Personnel considerations (e.g., 5 years on the job, good attendance, etc.) and then finally an "elite" group of 50 persons who successfully complete the BPI Certification as Large Boiler Plant Mechanic (the tentative certification title). From our last meeting, as well as feedback from the working meeting last Friday, it seems that a solution has been put forth that could work for all parties.

Specifically, since there may be qualified and energetic HPT's who have relatively brief experience in NYCHA, as well as older employees who fit into established personnel criteria yet may have no interest in taking the training and certification, the proposed solution would be to let BPI help select the "elite" group who will be further trained and prepared for the BPI Certification. BPI would prepare a written "pre-screening" exam that could be offered to all HPT's and conducted in the classroom at AEA's offices in mid-town Manhattan. The exam questions would be prepared by NYCHA's Staff Development, AEA, and BPI, and the test would be administered by AEA and graded by BPI. A cut-off score could be established to determine the appropriate top percentage of those taking this written pre-screening test; and these high-scoring candidates would then be invited to complete a two-phased training program to be run by NYCHA's Staff Development.

The proposed first phase of the training program would be a seven week cycle, two days per week (either Monday/Wednesday or Tuesday/Thursday) for a total of 14 classroom and hands-on sessions, designed

primarily to refresh the participants on the skills and knowledge important for optimum performance in their current position. This first cycle would also lay the groundwork for the more advanced mechanical phase. The areas of expertise and syllabus proposed for this first phase are attached to this letter. After completion of this first phase, which may also include technical training at the candidates' current work sites, these HPT's would be ready to move onto an advanced Phase II of training, which has been tentatively called Diagnostics and In Depth Repair and Overhaul. This cycle would run the same length as Phase I, with fourteen training days divided into two days per week for seven weeks, and would combine field, classroom, and workplace training, as well as assignments in all three settings. Throughout this two phased program, candidates would be asked to develop a much higher level of understanding, and would be tested regularly to ascertain their level of comprehension.

It is my understanding that NYCHA's Staff Development people are confident that they have all of the necessary training materials and staff to complete Phase I of this training. For Phase II, many of the diagnostic "flow charts" will need to be developed. AEA and BPI would work in concert with Staff Development to create these training tools, and again, candidates would be regularly tested on these complex technical areas. An outline of the areas of expertise and syllabus for this phase is also attached to this letter.

I believe that this training schedule works well from an adult education perspective, particularly for this type of job-related, professional skills development, in which the training can be reinforced by workplace activities. The two-days per week training also allows candidates to train without being "lost" on the job for prolonged periods of time, and also offers the possibility of scheduling two groups of two-day trainings each week (e.g., both T-Th and M-W), should you decide either to train a larger pool or to reduce the size of each class.

Throughout this two phased process, AEA and BPI will be working with NYCHA's Staff Development group to prepare the most appropriate written and practical questions to be incorporated into the BPI certification for the Large Boiler Plant Mechanic. At the completion of NYCHA's training, BPI will schedule the actual Certification to be held at NYCHA's training facility, and AEA would administer the testing and assessment instruments that will be part of the certification process, using proctors from both AEA and NYCHA Staff Development. BPI would be responsible for providing proper orientation to proctors regarding appropriate testing procedures, and would also score the tests and provide reports analyzing the certification test results.

I appreciate the time and effort that you and your staff have put in to get this training and certification process off the ground, and I was impressed with the quick turnaround that our combined staff worked within over the past two weeks.

Please let me know your comments, and the comments of others you deem appropriate, with respect to the approach I have summarized above, as well as comments on the attached material on the training modules.

Sincerely,



David Hepinstall
Executive Director

Training Modules for Existing HPT's to prepare for BPI Certification

Phase 1: Refresher of HPT responsibilities and Preparation for Diagnostics, Repair, and Overhaul

14 Classes two days per week for 7 weeks. Will include field assignments in: identifying system types and major components; compiling nameplate data; tracing system piping and equipment; identifying and collecting references and resources. The topic areas listed below are a review of major components, functions, and operations. These topic headings will be covered in phase two, with special emphasis on maintenance, repair, overhaul, and troubleshooting.

Areas of Instruction:

1. **ORIENTATION:** Duties and responsibilities; safety in the boiler room; time and attendance; forms of the technician; the log book and other logs
2. **BOILERS:** Field trip to plant; the various types of boilers; parts of the boiler, including: crown sheet; tube sheet; tubes; mud legs; fire and smoke box; smoke bonnet; steam nozzle; dry pan; man hole; hand hole; stay bolts - through stays - diagonal stays; Water level; operating safety valves; feedwater regulator; water column regulator; water column assembly; gauge glass; try cocks; pressuretrols; vents and gauges; boiler skirts and drains; pressuretrol, vaporstat, modulating control, pressure gauge, manual reset pressuretrol, pop safety, ASCO switch
3. **FEEDWATER:** getting the sample for testing; testing; piping from boiler feed pump to boilers; purpose of equalizing pipes (steam and water); city water feed system; feedwater pump (principle of operation); pump maintenance; pump accessories;
4. **CONDENSATE TANK:** traps and strainers; vacuum breaker - air valve; check valves and gate valves; McDonnald regulator; maintenance; Roof Tank - maintenance and inspection
5. **FUEL OIL SUPPLY:** fuel oil by-pass; oil relief valve; fuel oil supply to preheater; pressure relief valve; stop & by-pass valve; temperature & pressure gauge; aquastat performance & functions; **FUEL OIL TANK:** fill box; fill line; tell-tale line; test well; manhole; ladder; vent line; vent line head; low suction; high suction; suction breakers and return lines
6. **BURNERS:** Burner types: atmospheric-modulating-step firing-rotary cup. Principle parts of the burner: motor; spinning cup; primary air fan; fan casing; primary air damper; air nozzle; burner hinge. Burner controls: mercury tube; magnetic coil; relays; potentiometer; lead sulfite; ultra violet sensor; photo cell; flame rod; micro-switch; amplifying circuits. Controls and their function: disconnect switch; remote control switch; automatic or operating pressuretrol; manual reset pressuretrol; low water cut off; motor plug or door latch; cold oil interlock; motorized louver; combustion shut off; programmer; modulator; ignition assembly; air flow interlock; magnetic oil valves; master pressuretrol; remote control switch; fireomatic; fusible linkage
7. **STEAM DISTRIBUTION:** steam traps and principles of operation; float operation of traps; operation of thermostatic trapping element; servicing of traps. Steam systems: One-pipe gravity system; two-pipe gravity system; vapor steam system; condensate return system; vacuum return system; sub-atmospheric system; Dunham sub-atmospheric system; National sub-atmospheric system; National and Dunham

8. DOMESTIC HOT WATER: hot water generating tank; cold water supply to the tank; supply piping; hot water return; pressure relief valve; hot water supply; hot water supply line and valve; check valve and by-pass valve; vent trap; drain valve; maintenance thereof; HOT WATER GENERATION: steam supply to the tank; steam supply piping and coil; thermostatic control valve; vacuum breaker
steam traps; air valves;

9. HEAT COMPLAINTS: information needed; what to look for; importance of the heat complaint

10. AIR POLLUTION: what is air pollution; what are three components of air pollution; what is the technicians's role in the control of air pollution; (The four emergency steps--forecast-alert-warning-emergency) emission standard for smoke; Air pollution control code for smoke; emission of smoke according to its use; the Ringelmann chart and its use; smoke alarm; thermal inversion; the draft; CO2 Testing and readings; taking the sample; gas testing; significance and importance of CO2 testing

11. ENERGY MANAGEMENT CONTROLS: Heat timers and how to operate; Hydrotherm controls and how to operate; Dunham Bush controls and how to operate; thermostatic sensors; other (computer control panels)

12. FUNDAMENTALS OF SAFETY: OSHA and MSDS requirements; water main, gas main, electrical shutoffs, fuel leaks; electrical safety; garbage, debris, and flammables in boiler room and basement; proper lighting throughout basement and boiler room; boiler room security; lead, asbestos, mercury, and other hazardous materials

Phase 2: In Depth Repair, Overhaul, and Diagnostics

Upon completion of Phase I, candidates will be given a two week break, during which time they will review all of their previous course work, much of which reflected upon what would be covered in Phase II. This also will cover 14 Classes two days per week for 7 weeks. Field assignments will include going with burner mechanic crews on trouble calls and generating reports; and detailed maintenance and repair tasks, verified by instructor, supervisor, Borough. The training will reflect overall control of the heating plant, dynamic system relationships, and plant troubleshooting. All of these will be presented in flow-chart mode to encourage logical thinking steps.

Areas of Instruction:

1. OIL HANDLING SYSTEMS: Fuel pumps, filters, types of fuel oil, fuel tanks, oil heaters,
2. GAS SYSTEMS: Gas lines, safeties, booster pumps, regulators, shut offs, and all street to burner connections
3. ELECTRICAL SYSTEMS: Transformers, motors, ignition systems, burner operation controls and safeties, electrical theory, use of multimeter
4. COMBUSTION TESTING, SCIENCE, AND CHEMISTRY: The combustion triangle; Draft, Smoke, CO, CO₂, O₂, stack temperature, net stack temperature; Using test instruments; Results of combustion tests-what the tests mean; Burner setup at all firing rates for oil and gas; Combustion chambers
5. BASICS OF STEAM DIAGNOSTICS: steam leaks, water hammer, boiler water surge, cold radiators, pitch, valves, vents; water surge diagnostics, dimension A, water hammer diagnostics, distribution/balancing strategies; windows as diagnostic tools, radiator covers and turning off radiators as de-rating, steam distribution, vacuum system
6. BURNER REPAIR AND OVERHAUL: Flow chart thinking in burner repair; Electrical and fuel failures that cause downtime--diagnostics; Types of burners: rotary, atmospheric, step firing, full modulation, interruptable; Assembly and disassembly of burners; Preventative maintenance, troubleshooting, and repair; Summer overhaul, store room setup, ordering supplies
7. DOMESTIC HOT WATER AND HYDRONIC HEATING SYSTEMS: Types of DHW systems; diagnosis of problems; Typical hydronic systems; diagnosis and repair

SDGM #194-98

NEW YORK CITY HOUSING AUTHORITY
ENERGY DEPARTMENT

Paul Graziano, General Manager
Walter Alicea, Senior Deputy General Manager

OM: William Steinmann, Director *MS*

TE: June 25, 1998

BJECT: BPI'S HPT CERTIFICATION PROGRAM AGREEMENT

As you know, we have been working to develop an advanced level for Heating Plant Technicians (HPTs) which will offer employees promotional opportunities. Acceptance into this program will be contingent upon employees having passed a certification exam given by the Building Performance Institute (BPI). In an effort to establish this training program, NYCHA has been working with an affiliate of BPI, the Association for Energy Affordability (AEA), to design a curriculum specifically designed to meet NYCHA's need for more highly trained HPTs.

The New York State Energy Research and Development Authority (NYSERDA), the New York State Division of Housing and Community Renewal (DHCR), the state of Vermont and the U.S. Department of Energy (DOE) have all played major roles in supporting the development of BPI as a "third party" entity authorized to provide independent industry-based "certification" programs for specific job titles within the building performance industry. Although initially the HPT certification program was introduced by New York State, from its inception BPI has been national in scope. Therefore, following several meetings with AEA, the involved departments at NYCHA have reached a consensus that the program outlined by BPI will meet the desired goals of the Authority.

Listed below is the proposal for an Advanced Heating Plant Technician certification program. We have agreed to the following points.

1. In conjunction with NYCHA's Departments of Staff Development and Energy, BPI will prepare, administer and grade a pre-certification test to be used to identify those HPTs deemed eligible for the training program. We estimate that 350 to 400 employees will be taking the exam. BPI is to receive \$7,500 from NYCHA, which includes both the preliminary work involved in setting up and developing the exam as well as the testing/grading procedures. The target test date is August 1998.

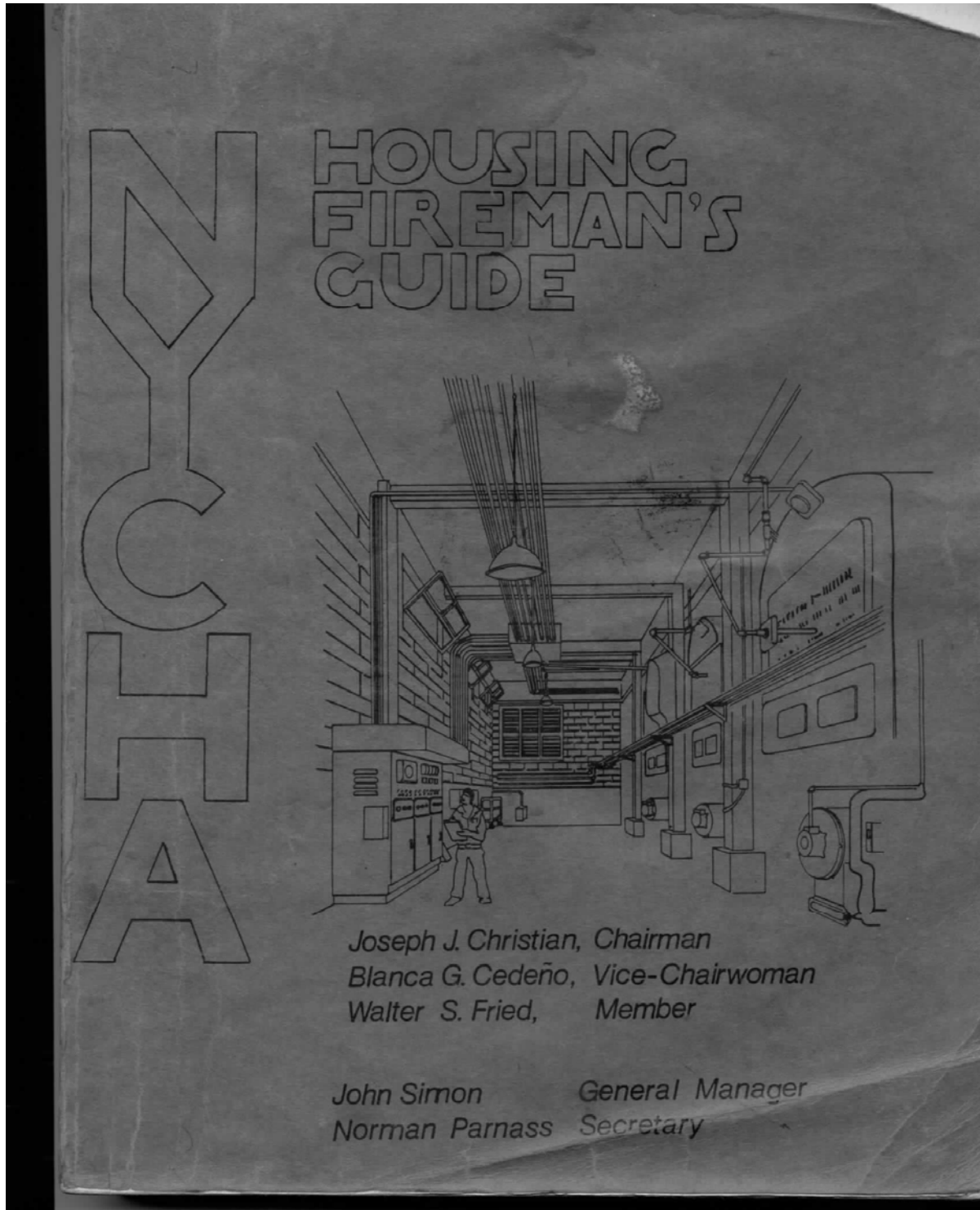
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2. With input from NYCHA's Staff Development Department, and using NYCHA's classroom mock up boilers and field facilities, BPI will prepare and administer written and field exams for certification under the job title "Advanced Heating Plant Technician." NYCHA will pay \$400 per certification exam for an estimated 50 people. Non-NYCHA employees taking the certification exam will be charged \$500 per person.

May we have your approval to enter into this agreement with BPI/AEA?

Approved Paul 7/7/98 Approved Walter Alicea 6/26/98
Paul Graziano Date Walter Alicea Date

Appendix A.4.4
NYCHA Fireman's Guide (1982), Table of Contents

The Table of Contents of this document is provided as a reference to the scope and technical detail of the HPT/Advanced HPT knowledge and skills requirement.



NEW YORK CITY HOUSING AUTHORITY

STAFF DEVELOPMENT DIVISION

HOUSING FIREMAN GUIDE

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