

Laboratory Versus Field The Dilemmas and Hazards of Acoustical Consulting

Riverbank files kept since 1918 reveal not only how Paul Sabine utilized the laboratory to resolve various field-related acoustical consulting problems but how many consultants did likewise. Because the files disclosed a particular dilemma associated with acoustical consulting, this chapter is dedicated to these decibel chasers in the field.

Acoustical consulting is a field that requires a working knowledge of various engineering and scientific principles tempered with an ample mix of conventional wisdom, practical and technical know-how, business smarts and common sense, personal insight and vision, responsibility, and dedication. Even if one possesses all these traits, many acoustical consultants will add good luck and charm as fundamental requisites as well. The acoustical consultant, whose efforts can have tremendous impact on the aesthetics of any construction, has as his or her primary concern, solutions to help control the world's fourth and growing major form of pollution: noise.

Typically, the acoustical consultant is contracted to provide a better acoustic environment for either part or all of a building or, as is more often the case, to correct various noise-related problems, after the fact. If the acoustical consultant has completed a job well, his or her efforts are often not noticeable, especially if the designed aesthetics of the structure were maintained. As one experienced consultant puts it, "Good acoustics is heard and not seen." Paul Sabine wrote in a letter, "The interesting thing about being an acoustical consultant is that quite often all that is required to project ones' need to a perspective client is to explain the problem that he already knows about in a language he absolutely cannot understand."

Many acoustical consultants spend an entire lifetime resolving acoustical problems for business, industry, private individuals, and government agencies at all levels. When given the opportunity, some consultants will take on the challenging aspects of major civic and performing arts centers, drama theaters or churches; however, for reasons that might not immediately be obvious, the one consulting assignment that creates the most challenge (some would say *risk*) is a hall for music performances — primarily large halls, such as Boston's Symphony Music Hall and New York's Carnegie or Avery Fisher halls.

Each hall and its respective acoustical consultants are compared to other halls not only in terms of the acoustics but also the effects that the acoustical treatment had on the aesthetics. Unfortunately, acoustic control measures are not always compatible with the appearance as it was envisioned by the architects of the hall; therefore, conflicts can arise between acoustical consultants and the architects, contractor, or the clients. Designing a successful hall for every possible type of musical performance and the full musical literature — one that pleases everyone, patrons, performers, and owners alike — is analogous to a baseball pitcher throwing a perfect game in the World Series; although it has happened, the odds against it are astronomical. Also consider how few world-class pitchers have ever pitched a perfect game or even a no hitter. When you consider the career statistics of one pitcher, Don Larson, who did pitch a perfect game in a World Series, much more is involved than just Larson's pitching abilities for him to accomplish this remarkable feat. His pitching ability was a required basic ingredient, but to achieve the ultimate, he had to have the perfect situation, the right environment, administrative backing, managerial and fan support, teamwork, communication, cooperation (willingly, his team; reluctantly, other team), control (be physical in charge), acceptable results along the way, and good luck.

It doesn't take too much imagination to substitute acoustical consultant for pitcher in this analogy and performance hall for World Series. With the latter in mind, it is the *performance hall* that becomes the primary source in creating the dilemma or hazards that many acoustical consultants must face. To satisfy the sensory responses of its patrons, a large performance hall must be pleasing to the eye and have an overall ambience that is conducive to enjoyment by a wide range of individuals. Seats must be comfortable; lighting and sound systems must be adequate; and the air cannot be too dry, too humid, too hot, or too cold. The line of sight to the performers should not be impeded by pillars or overhangs. The building itself should be accessible and provide the necessary ancillary services. Add the acoustical consultant's concern — the virtual elimination of noise and distortion — and specific considerations for performers, administrators, and maintenance and service personnel, and a clear picture of the immensity of the task becomes apparent.

In the past two decades, the relative physical, acoustic, and aesthetic attributes of different performance halls have been the subject of numerous re-

search studies and publications. In write-ups on certain projects, the acoustical consultant's efforts were considered essential to the hall's success. The acoustical consultant is often the one held primarily responsible if a hall is not successful acoustically. However, as most experienced consultants know, a successful hall results only from a truly symbiotic and cooperative relationship among all the participants in the great drama of creating frozen- music architecture for the arts. This cooperative relationship must start in the early planning and programming stages of the hall's design and continue throughout its construction and the initial stages of the hall's use.

If a hall gains a deserved or undeserved reputation for acoustic limitations, the consultant can live forever with the failure, in spite of any past credits. Often, unjust ridicule from competitive consultants within the profession can be the most damaging because it affects not only the individual consultant but the entire field of acoustical consulting as well as the science of architectural acoustics.

When a new hall is deemed unsatisfactory, another consultant is often called on to correct the situation — without the desired collegiality between the two. Some consultants regard the position of second consultant as somewhat easier because the hall and its problems are real now rather than on paper. Sometimes, the opportunity for change is dramatic, that is, making the hall livelier (more reverberant) or more dead (more absorbent). More often, however, the difficulties are more subtle and less quantifiable because as indicated earlier, concert hall acoustics is a complex mix of interdependent variables. Of course, handling the desired aesthetics and dealing with architects and owners on corrective measures are always challenges for any consultant, regardless of when he or she enters the project. If there is sufficient pressure from music critics, the musicians, or the public, clients might have relinquished some demands, impeding the efforts of the original consultant. Oftentimes, the second consultant can insist on more freedom than his or her predecessor ever dreamed of having. If successful, the second consultant's reputation should be enhanced; however, praise for these consultants more often than not is overshadowed by the negativity of the comments about the failure of the first consultant. The late George Szell, leader of the Cleveland Symphony Orchestra, said in chastising a fledgling acoustical consultant at the opening of a school auditorium, "You American acousticians know nothing about music"; too often, old and ingrained prejudices of the musicians, clients, architects, and acousticians themselves have contributed to the perpetuation of stories of acoustic failures, if not to the failures themselves.

Until recently the risks in deviating from the traditional hall designs of the past have limited the creative contribution of acoustical consultants and architects alike: conservatism was the status quo. Any attempt to change was usually discouraged at the onset. No one wanted to risk paying for something new and different and chance being stuck with an acoustical lemon. In the

past few years, however, many new auditorium designs have evolved all over the world, much to the delight of the audiences. No longer do concert halls have to be rigid rectangular, decorated shoe boxes. The vision and involvement of some acoustic scientists and consultants have resulted in halls that are appealing to both the eye and ear.

Because of innovative efforts, many cities can now boast of new halls that identify with designs of the time, provide many new visual and added comforts, and have outstanding acoustics. No longer do patrons of the arts feel they have to observe a performance inside a Boston Symphony Hall-like chamber to enjoy it. Some critics who had remained true to their conservative ways for many years are now changing their rules because of the new aural and visual aesthetics provided in performance halls located throughout the world. Of late, the word “intimacy” has come into vogue with critics, consultants, and architects providing an agreed-upon way of assessing the merits and flaws of a performance venue. Consultant Leo Beranek first made widespread use of this term and measured it in halls with his initial time-delay gap. Beranek’s *Music Acoustics and Architecture* has had more influence on the musical, architectural, and acoustic community than he ever could have possibly imagined — especially in framing a common dialogue in discussing a design. Many architectural acousticians regard Beranek’s contributions to architectural acoustics on a par with Wallace Clement Sabine’s original work in defining room reverberation time.

Yet Leo Beranek was a victim of a consulting dilemma regarding New York’s Lincoln Center Philharmonic Hall (now Avery Fisher Hall). After Beranek had submitted his drawings and concept for what he felt would be needed to achieve good acoustics in the original design of Philharmonic Hall, many modifications to that original design followed. When completed, opinions regarding the hall’s acoustics varied. The word that the hall had poor acoustics began to spread and those in charge of the hall reacted. Instead of allowing Beranek the opportunity to test and make any corrective measures, a team of consultants was brought in and after their suggestions failed, another consultant was hired to remedy the situation. Eventually that consultant was successful and received credit for his excellent efforts.

In his book, *Science of Sound*, Northern Illinois University physics professor Thomas Rossing (recent ASA silver medalist in music acoustics) discusses the entire modification process that occurred at the Philharmonic/Avery Fisher Hall. Rossing also mentions that the original modifications instituted were made without the knowledge or support of either the consultant or the orchestra and that those modifications created design changes that contributed to the hall’s deficiencies.

Beranek’s consulting dilemma was as follows: although hired as the chief acoustical consultant and delineating the initial acoustical design parameters for the hall’s original design, he was never informed about the various

changes to that design instituted by others. Since the modifications to the design contributed to poorer acoustics, Leo was never allowed to make any tests or corrective measures. Yet, it was he who took the brunt of criticism for the hall's poor acoustics.²⁸

In May 1988, Beranek presented papers at the 115th ASA meeting in Seattle, Washington and evoked laughter from his audience through numerous self-deprecating remarks made about the Philharmonic Hall phase of his career. At the conclusion of his presentation he received a standing ovation.

Another noted acoustical consulting dilemma involved the now acoustically sacred Boston Symphony Hall. From the early 1920s to the present day, this hall has been regarded by many critics as a magnificent hall for music — near perfect for some repertoires. The acoustical consultant, as noted earlier, was Wallace Clement Sabine. After his death, a memorial ceremony was held at which a number of noted speakers extolled Sabine's many accomplishments. One, a music critic, commented that Boston's own symphony music hall is one of the best in the country, primarily because of the efforts of Wallace Sabine.

Since Sabine's death, Boston Symphony Hall has received nothing but high praise, yet when it was completed in 1902, Sabine's work was mercilessly panned. At the time *The Boston Evening Transcript*, Boston's then influential newspaper, printed an article written by a scientist, Frank Waldo, who included the remarks of another scientist, J. B. Upham, both of whom commended the acoustics of the symphony hall. Appended to their article, however, as a sort of counterpoint, was the viewpoint of the *Transcript's* music critic, William Foster Aphrop, who stated,

This is all very well; but, like many essays on musical subjects by scientists, it arrives at conclusions with which most musicians find it difficult to agree. To begin with, neither the late Dr. Upham nor Mr. Sabine can be deemed competent to express a musical opinion of any weight whatever; both came musically in the amateur class, and, to conclude with, we have not yet met the musicians who did not call symphony hall a bad hall for music. Expert condemnations of the hall differ, as far as we have been able to discover, only in degrees of violence.

Aphrop's opinion, although weighty at the time, did not stand up for long. After a two-year hiatus from consulting, Wallace Sabine returned to the line of work, perhaps not so coincidentally at a time when public acclaim for the excellent acoustics of Boston Symphony Hall was at its peak. In any case, Sabine was vindicated and the hall remains an excellent place to make and hear music.

Around 1993 Leo Beranek reported that in 1987, he had received some documents from Emily Thompson, a doctoral candidate in history at Yale University who was writing a dissertation on architectural acoustics before 1930. One document was a letter from Wallace Sabine to the architect regarding the completed Boston Symphony Hall. In this correspondence was Sabine's answer to the question, How did you react to the negative criticism in the period just after the opening of the hall in 1900? The letter was dated

May 1, 1901, and although Sabine was defensive, he discussed in detail the “loudness, clearness, interference, resonance, and reverberation” of the symphony hall. He concluded, “On the certainty of my work in this respect I shall not yield.” The other document dated about a year later (1902) and sent to the same architect was from a Mary Elliot of Boston. In the letter was the following comment: “A friend of ours who is a Musician told me the other day that Gericke (the conductor) and the musicians generally are feeling differently about the Acoustics of the Symphony Hall this winter, the music sounds beautifully and they think that the general drying out of the materials has made a great difference in the resonance.”

A hall can be labeled or rated good or bad based on its opening performance alone and can be left with this label, despite the fact that it might be nothing more than the opinion of a noted conductor, performer, journalist, or, as is most often the case, a professional music critic. The critic, whose job is to evaluate, compare, and judge a performance and the facility, especially on opening night, serves a useful function. Not only does the critic inform the public of the merits or faults in a particular arena or program, but the critic is also responsible for noting flaws in the design of a hall. On what criteria does a critic base his or her judgment? What factors besides the performance and the hall, might he or she be weighing when sitting down to write a review? These questions are often discussed.

If on opening night a performance hall were labelled as having bad acoustics and if there were no obvious contributing noise sources and if the performers were vindicated as being the cause for the bad acoustics, then the most obvious candidate for a critic to blame would be the acoustical consultant. Even if the critic had some reservations regarding the actual cause for the bad acoustics, meeting his or hers immediate press deadline would surely outweigh any notion of delaying the review in order to conduct a full investigation into the matter first. After the critic's comments are printed and various reputations (hall, consultant, owners, city officials, etc.) are tarnished if not ruined, the critic could be the individual responsible for the damaged reputations. Simply put, a critic could be wrong and cause unwarranted damage.

How often has a movie critic given a movie a low or thumbs-down-rating and therefore many movie goers didn't go to see that movie. Yet those that did see the movie actually found it very good. Thus, because of the critic's review, the movie producers, directors, actors, as well as the movie theater owners all could have suffered both financial losses and loss of reputation. Hopefully, the use of “intimacy” as a criterion may help correct the performance hall situation.

To this point, the examples in this chapter have focused on consultants whose initial work on a hall was not fully appreciated by the architects, owners, and music critics. What about performing arts halls that have problems no one seems willing to recognize or even publicize? In a sense an acoustical

consulting dilemma, but in reverse. The hall is bad, but the original consultant was credited by the performers and critics as providing a good hall and everyone else thinks likewise.

Consultant-historian Ewart A. Wetherill tells of one notable instance: An opening performance featured a renowned conductor leading a celebrated orchestra in a hall so elaborate in design that there couldn't possibly exist a chance that anything was wrong with the acoustics, especially when the audience rose in unison and responded so enthusiastically that an encore and many curtain calls followed. The following morning, the beautiful hall, the performance, and the owners all received rave reviews in local and national newspapers.

Years later, however, many performers realized through conversations with their peers that most of them found the hall to be a difficult place to perform. The reviews that they had received were kind, but the performers were upset by subtleties such as "she sang her entire solo in *pianissimo*"; the performer, however, knew she had sung with a full voice. Another review commented, "How beautifully a solo violinist blended in with the strings of the local orchestra," when in actuality, the soloist felt the accompanying strings were playing too loud and drowned him out.

No one suspected this fine, oft-praised hall actually had poor acoustics in the upper frequencies — even though time-decay measurements conducted during a renovation confirmed the excessive high-end loss. The new consultant had great difficulty convincing the owners that modifications in the amount of absorption could significantly alleviate the problem. The owners, however, wanted exact conformity with the original design. The consultant agreed to add the original amount of absorptive material if the owners would agree to listen to a performance with 60 percent less material; he was able to prove his point. The hall is still regarded as one of the best, but now the orchestra's string section is getting reviews that are typically reserved for winds and percussion.

Another performance hall dilemma involves the Kleinhans Hall in Buffalo, New York. It is critically acclaimed as one of the better music halls in the United States. At its dedication in 1941, another consultant — another Sabine, Paul E. Sabine — was on the receiving end of the negative criticism. However, perhaps because of the consulting work he had done prior to the Kleinhans Hall project, Paul Sabine's reaction was much different from that of Wallace. He was ready for criticism and ready to respond. In 1934, for example, having recently completed a consulting job for Radio City, Paul Sabine published an article in which he explained why he had designed the rooms the way he had, using Wallace Sabine's description of the basic requirements for an auditorium as an introduction:

In order that hearing may be good in any auditorium, it is necessary that the sound should be sufficiently loud, that the simultaneous components of a com-

plex sound should maintain their proper relative intensities, and that the successive sounds in rapidly moving articulation, either of speech or music should be clear and distinct, free from each other and from extraneous noises. These three are the necessary, as they are the entirely sufficient conditions for good hearing. As an engineering problem it involves the shape of the auditorium, its dimensions and the materials of which it is composed.

In the same publication, Paul Sabine referred to Radio City Music Hall, where all sorts of vocal, music, and, most particularly, movie presentations would take place. Because of the varied forms of entertainment planned, Sabine decided on a reverberation time of 1.8–1.9 seconds as a compromise in the 1,800,000 cubic foot hall. After explaining his rationale, he went on to say that he suspected not everyone would agree with his decision:

The organist and orchestral leaders will complain that the room is too dead i.e., too little reverberant for organ and orchestral music. On the other hand a room that is more reverberant would have called forth a fire of criticism from the motion picture engineers. A compromise that will placate if not please both extreme demands is about the best that can be hoped for. How well this compromise has succeeded in pleasing public taste one can only judge by the fact that up to the present no criticism of any kind as to the acoustic properties of the room has been received. I believe that the architect ordinarily considers that this is about the most in the way of public approval that he can expect in this “best of all possible worlds.”

Paul Sabine received good reviews on the hall as he did for his consulting on the Chicago Civic Opera House, the San Francisco Memorial Opera, the Ravinia Theater, the Fels Planetarium in Philadelphia, Bankers Life Building and Joslyn Memorial Hall in Omaha, Nebraska, as well as the auditorium for the Christ Church in Little Rock, Arkansas, the Wurlitzer Corporation, the U.S. Air Force (Army Air Corps) auditorium at Wright Field, the Jewish Center in Detroit, the Goodyear Theater in Ohio, and many others. Yet as mentioned earlier, Paul Sabine also had to face unnecessary criticism. What follows is a history of sorts of the Kleinhans Hall project, reconstructed from Sabine’s files at Riverbank. It serves as an example of the forces acting in opposition to an acoustical consultant.

The Hazards of Acoustical Consulting The Kleinhans Music Hall Dilemma

The Best Man Available, But!

In late 1938, Paul Sabine completed his report on the revision he felt necessary for obtaining good acoustics in a proposed design of a concert hall in Buffalo, New York. The design had been submitted to him for comment by the architectural firm of Eliel and Eero Saarinen of Bloomfield Hills, Michi-

gan. The Saarinen indicated they were impressed with Sabine's observations and offered him the position of consultant if they were awarded the design commission.

In January 1939, the acting director of the Kleinhans Music Hall Inc., Ester Link wrote Sabine a letter of praise on his contribution to the Saarinen design, which had won the contract. She then informed him of the embarrassing situation that now faced the Saarinen. The Kleinhans Board of Directors had already subcontracted with the local architectural firm of F. J. and W. A. Kidd, who, in turn, had already granted the position of acoustical consultant to the Electrical Research Products Institute (ERPI) of New York. However, Link preferred Sabine's design over ERPI's because she felt ERPI's recommendations would lead to an acoustically dead hall. She hoped that Sabine could be retained and that ERPI could simply be eased out.

In Sabine's reply, he mentioned that he had sensed there was some problem when he visited the Saarinen at the Cranbrook Academy of Arts. However, he also sensed from their comments that they still desired his service in some capacity: "I have worked with a great many architects in this manner and I am convinced that only by close cooperation between the architects and the acoustical consultant can the best results be secured."

Ester Link, apparently motivated by the idea of acquiring Sabine's services, responded with a lengthy letter. She explained how the board had agreed from the onset that to have a good hall, good acoustics were essential. Therefore, they needed the best person available:

At that time you (Sabine) were on holiday, Vern Knudsen in California was too far away and Fay was on an island off the Maine coast. Then Leopold Stokowski who had great success working with ERPI on his radio broadcast recommended that in the east Mr. Stanton was the best man. Stanton also was recommended by Ralph Walker, an architect for the New York telephone company. Since one of our directors also is a director for the same telephone company and since ERPI is a subsidiary of theirs, ERPI was given the contract.

Link went on to say that although Saarinen was allowed to use whatever acoustician he wanted, the privilege only continued until the preliminary design was completed. Saarinen and Foulhoux (who had worked with Sabine on Radio City Music Hall) preferred Sabine to ERPI. Link added her hopes,

... that the building committee would still retain Paul and relegate ERPI to the position of technical consultant. Yet to explain away an organization of such magnitude and unlimited self confidence, plus such tremendous output and the backing of Stokowski would indeed be most difficult. Although the Saarinen prefer you, they under the circumstances are forced to recognize ERPI. Representing ERPI is Mr. Potwin. Fortunately he did study the violin for nine years and since I do prefer a musician who is a physicist or a physicist who is a musician, rather than a non-musical engineer, I still feel confident that ERPI will be inclined to make the hall overly dull.

In the next follow-up letter, Sabine mentioned that the outstanding reputation of ERPI was justified by the successful work that the firm had done on many theaters and auditoriums; however, "As I observe the general trend at the moment I have a feeling that there is a tendency towards [sic] over absorption and that unless the acoustical engineer has someone like yourself to hold them in check the music halls are apt to come out on the dull side."

Sabine then reminded Link that he could not act officially unless retained by the Saarinens. Immediately, Link informed them to, at least, have Sabine make some decisions before it was too late, especially because the board had decided to install air conditioning for which no noise-reducing recommendations had been made. Sabine wrote to her:

My situation is somewhat ambiguous since I have not been officially retained by the Board of Directors and neither Mr. Saarinen, nor his son, had definitely indicated in just what capacity I am supposed to be acting. I shall of course be very glad to render any service that I can toward the realization of your ideal of an acoustically excellent hall.

Link mentioned that the president of the Kleinhans Music Hall, E. H. Letchworth, had instructed the local architects, the Kidds, to inform ERPI that they were to work with Sabine on the final acoustical conditioning. In this way, the Saarinens were spared the embarrassment of seeming to be doing something contrary to the board's or the Kidds's wishes. She also mentioned that because Sabine had the plans that perhaps he and Potwin might confer together with the Saarinens. Link then confirmed that the following had been accomplished:

1. Our President is sponsoring you. 2. The local architect has the job of informing Mr. Potwin and getting him to cooperate with you and 3. The Saarinens are supportive. They have succeeded in getting Mr. Potwin to take over most (perhaps you'll only say "much") of your original plans. Now, let's hope since Potwin has been collecting honors on your work, that he will be eager to accept the rest of it. I hope with the Saarinens enthusiastic support which I know you now have, that you will take a stick to them. Take cover and hold fast. If Mr. Potwin really wants to shine he'd better get underneath your light.

Paul Sabine demonstrated his comprehension of, as well as apprehension about, this whole matter when he explained:

In view of all the complications, I think it would be very wise for me to withdraw from this situation entirely. There is no situation that I am aware of which is more full of dynamite from the standpoint of public criticism than the acoustics of a concert hall which is in the nature of public enterprise. People do not agree on just what is desirable, but everybody thinks he knows good acoustics when he hears them, with the result that no matter how carefully planned a room may be in this regard, there will always be plenty of people to remark on how abominable the acoustics are (or is, I never know which).

Sabine added that Potwin and ERPI understood his reason and because, un-

der the circumstances, responsibility for the results would be defined and because no doubt by this time the plans were fairly fixed, Sabine believed that he could not render much further service. He ended by saying he would merely send his bill to the Saarinens and relieve them of a great deal of embarrassment. "Please understand there is nothing of pique in the matter. It seems to me as the simplest way out of the situation." On August 28, 1939, Sabine billed the Saarinens the sum of \$99.00 for his services. Before the Saarinens paid Sabine, they received a letter from the architectural firm of F. J. and W. A. Kidd:

We can see no reason why you should not consult Mr. Sabine concerning the acoustics at the Kleinhans Music Hall provided it does not entail any additional expense. We mean by this that the board will not want to pay additional fees or any extras that may be entailed by Mr. Sabine's suggestions.

The Saarinens decided to pay Sabine the \$99.00, and on September 29 Eero Saarinen wrote, "I am a little embarrassed about the way we left the whole situation unsettled for such a long time. I believe, however, that the electrical research products engineers should finish this job as they are now working quite hard on it. I hope that sometime in the near future we shall be able to work together on another problem."

Sabine acknowledged this letter and stated that he understood the situation and that there was no occasion for embarrassment. Although he appeared to be attempting a dignified exit, it was not to be.

Make the Welkin Ring

On October 4, the persistent Ester Link reminded the Saarinens of the September 22 letter from F. J. and W. A. Kidd. She stated that they should take her into their confidence in regard to any additional expenses procured by Sabine. She emphasized that "The acoustical problems are the crux of the whole hall. Therefore, we should give great consideration to any recommendations that Mr. Sabine might make."

To help guarantee that Sabine would still be involved, she wrote another official letter to the Saarinens in which she stated that they had received permission for Sabine to do the final conditioning. Eero Saarinen was pleased but remained cautious. He requested that Letchworth put it all in writing. Link then wrote Paul Sabine, "Now that you are in the saddle again, I hope you will take courage and Make the Welkin Ring."

She further reminded Sabine how delighted she was in knowing that the hall was now in good hands and that they could not be allowed to jeopardize the hall by over conditioning. She ended the correspondence with a P. S. that was critical of Potwin:

I read in Potwin's two articles in the architectural forum where he expounded on the principle of acoustics and how they were applied in the Kleinhans Music Hall apparently by him. When you consider that the main acoustical problems

were determined by you and the essential design of the hall determined by the Saarinsens and/or us, the Forum article is really astonishing.

Apparently, Sabine was back on the job, although as his letter of October 10 indicates, it was not a qualified and entirely wholehearted return:

My anxiety arises from the fear that I am not able to justify the hopes which you have with regards to the acoustics of the hall. As I wrote earlier, there is so much psychology involved in public opinion with regard to the acoustical properties of a room that one is almost afraid to trust his scientific knowledge and experience in the face of possible adverse public opinion.

Sabine also stated he believed that his services could be applied without offense to Potwin. In fact, if the architect, Potwin, and he would get together in conference, they should be able to iron the matter out. Link responded with much flattery and some apparent knowledge of acoustical terms and people. Her return letter stated,

Your anxiety fills me with confidence. After all, it is the angels who fear to tread. You are considered by everyone competent to judge as one of the great acousticians of the country. Wallace Sabine, Knudsen, Watson, Miller of earlier days with such people as Fay, Cooke, and a few others you have the assurance of being one of the best available. I realize that Mr. Potwin has unlimited background on movie houses, where you would absorb the noises incident to the vi-tograph but your experience in music halls would intend to make it livelier. That is why you differ on reverberation length.

Link's follow-up letter was much more frantic in nature. She explained that Potwin was changing Sabine's original concepts, and now it would not be practical for numerous reasons. As far as she was concerned, they had to convince the Saarinsens to change back, although the expense would be great. To this comment, Sabine once again mentioned that if Saarinen would contact him, he would discuss the matter. This time, Link responded to the previous suggestion of a conference. On December 11, 1939, she wrote, "I called Eero and conveyed to him that working with you now instead of later might save him a great deal of needless work and worry."

Then, to Sabine she stated, "Your presence, even though in the shadowy background has been a pillar of light, your emergence now into the activities is a great source of rejoicing. By the way you are now in the employ of the owners — so your expenses are covered."

Sabine reminded her in a letter dated December 14:

You realize that professional courtesy pretty well ties my hands since the architect is the captain of the ship. I am sure that Mr. Saarinen will contact me, however, since I am retained by the owners, I suggest you ask Mr. Saarinen to let me have the latest blue prints. This reminds me of a similar incident in the past. It is nearly the situation as it developed in connection with the acoustical design of the large music hall in Radio City. In that instance I was employed by the architect and together we worked out the acoustical features of the design. This was

then submitted to Mr. Clifford M. Swan of New York who was employed by the owner of the building as an independent consultant.

Sabine realized that although he was retained by the board, professional ethics required him to be summoned by the Saarinens or the Kidds.

Too Many Cooks

On December 23, Link showed concern for Sabine's physical status, including a possible hospital visit, because he might be summoned to prevent Potwin from using a patented Flexwood covering for the interior that she said looked "chewed up and tacky."

Sabine regarded his current status as "like the farmer with a leaky barn roof. He couldn't patch it when it was raining and did not need to when it wasn't raining." He would be ready if called.

Finally, on January 25, 1940, E. H. Letchworth officially engaged Paul to work with Saarinen. Letchworth was also faced with another problem: If the project were not finished by June, they would forfeit 45 percent of Public Works Administration contract money.

Shortly thereafter, the Saarinens turned down the use of Flexwood. Stuart Welch, who was attached to the Kidd staff representing the interests of the Kleinhans Hall group, was instrumental in engaging Sabine and insisted that someone representing the owners should put it in writing. Miss Link wrote:

You can imagine with what delight and alacrity I dictated that letter. However, at the moment the Kleinhans roof is being constructed and the inside being finished. Please make speed. I realize how open and direct I must appear, however, it is the only way for me to obtain results. For my only wish is to have a good hall.

In a February 16, 1940 letter, Link showed concern for the involvement of the Saarinens in the Finnish Relief Program: "Although the situation is acute and serious for the Finns, my only hope is that in the present situation the Kleinhans Music Hall will not get lost by the Finns to the Russians." She also mentioned how Potwin was being squeezed by Welch to come around to Sabine's plans.

At this time (February 15 and 16), Sabine was faced with an emergency operation for a troublesome gallbladder. Link stated that she was sure Sabine would get well fast if only owing to curiosity about the Kleinhans plans. On February 20, Sabine received the plans from Edger Rollins Kimball of the Eliel and Eero Saarinen firm.

Still recovering from his operation, Sabine managed to forward his report on the large auditorium to the Saarinens on March 12, on rehearsal room #110 on March 18, and on the Chamber Music Hall on March 19. He maintained his original concepts from 1938, with recommendations to counter some changes already incorporated: "While in detail it is not exactly what I should have recommended, yet I feel sure the results will be satisfactory, and

I do not want this to be a case of too many cooks spoiling the broth.” Later, Sabine had to revise his recommendations on the rehearsal room.

What Are They Doing to the Place?

Sabine’s next task from Link was to decide between the recommendation of Leopold Stokowski, who wanted the orchestra to sit on the flat stage, or Serge Koussevitzky (another orchestra conductor), who wanted the orchestra to use risers. In addition, because a Steinway piano was used in the auditorium, what piano should be used in the chamber and rehearsal room?

Sabine answered that he was not a piano expert but that Kleinhans could not go wrong with a Steinway, and for psychological reasons, he preferred risers so that the people can see or be seen by those in the rear of the orchestra:

Personally I often entertain myself during dull moments in the music by watching the activities of the tympani and double basses. Yet a departure from tradition needs something more than a personal preference to justify it. There is of course no weight or authority in the forgoing so do not breathe this to Leopold.

Link followed with a three-page letter arguing for or against each point made by him and then ended with, “I hope you enjoy this desultory discussion, but as I insisted before, I just have to have the best.” Sabine tactfully replied:

When it comes to questions of this sort involving taste and personal preferences, the scientist, if he is wise, will tread softly and not try to carry his scientific prestige over a field where other people’s opinions are worth more than his. Besides like the late lamented Will Rogers, “All I know is what I see in the papers.”

Later he mentioned how rewarding an experience it was to read Link’s files of correspondence with Leopold Stokowski:

I am glad to see that I am in very good company since you also differed quite frequently with Stoki. Back in 1932 I talked with him about a plywood shell. I used this in the design of the orchestra set for Ravinia (in Chicago). I realized that Mr. Stokowski’s recent concerned remarks about humidity have a certain theoretical base, yet the effect is in practice negligible as far as acoustical properties are concerned. The pockets of the lighting covers are quite shallow and will not depreciate the volume of tone. My computed reverberation time for the Kleinhans Hall with the added treatment is now 1.9 secs and an audience of 300. This compares with 1.93 secs for the Boston Symphony Hall (650,000 ft³), 1.75 sec Carnegie Hall (737,000 ft³) and 1.9 sec Chicago Auditorium (975,000 ft³). Therefore it still is all right.

Potwin was still promoting Flexwood in a letter dated May 23, 1940. He favored a considerably shorter reverberation time and, unfortunately, found a mechanical way to put holes in the Flexwood. Saarinen figured out a pattern for the Flexwood instead of the hit-or-miss patches. Link stated her case on this subject:

If this means that your recommendations are to be abandoned because the Saari-nens are trying to avoid strained relationships — I don't know. After all, an architect can serve his client only to the extent that his client supports him. I agree there is no pleasing all the public. My procedure has been to engage the most competent experts available to determine our needs as exactly as possible and to support them in every way. To help them against all chiselers and would be modifiers, the reactionaries and the timid. More or less as a catalytic agent among the experts to help them bring about the things of which they were capable. I was confident the hall would be right fitting and appealing; the fact that the majority of people at first would find so modern a structure objectionable would not bother me at all. I know that those competent to judge would admire it immediately and that ultimately the rest would follow. That is why I want you as top man. So would it be ethical for you to check up with Saarinen as to just what they are doing to the place?

With the deadline near, the Kidd firm finally contacted Eliel Saarinen and asked if he would please confer with Sabine about the advisability of applying glued fabric to the finished plastered surfaces on the rear wall underneath the balcony. Letchworth would rather not make this change unless Sabine agreed.

At this time, Link was removed from her position. Nothing in the Riverbank files says why but speculation offers various possibilities: Sabine wrote Link on June 17 and mentioned that he did not know whether to extend condolences or congratulations on the loss of her job. He went on by reminding her that she had the most difficult task and, therefore, had the greatest satisfaction of a job well done.

Sabine's files indicated no further correspondence until October 10. The opening performances took place on October 12, 13, and 14, 1940. In the October 10 letter, he wrote Miss Link and said he was sorry that he wouldn't be able to make the opening performance:

I am of course tremendously interested in knowing the popular verdict with regard to the acoustical properties of the room as well as the enlightened opinion of musicians. I dare say neither of these will be unanimous because like art, the acoustics of concert halls is something that everybody knows what he or she likes.

Letchworth remarked in a letter to Paul Sabine that "Everything is going marvelously well. The acoustical properties of both halls seem to be perfect." However, Miss Link stated in her letter:

The hall is dead — acoustically. Singers complain they cannot hear each other, tones are not permitted to build up and develop overtones. Everything is very precise, even transparent. The hall is super sensitive and very critical. The tone stops too quickly. Such a condition will mitigate against the cause of music. I do not care if every last note of the clarinet and viola comes transparently to the fore. I and every other ardent musician will want opulence of tone, the color of overtones, the arabesque of musical splendor, and this cannot be secured where precision only is the ideal. People in the choirs complained that they felt as

though a candid picture, musically speaking, were being taken of them — every slight error is shown up so clearly. I feel rather that it is like taking a photograph through a fluoroscope, giving every detail, including the buttons on your underwear. Discriminating listeners and performers seem to hanker for a less precise and more natural tone. You were right, the perforations on the side walls should be eliminated. The problem is most prominent people are perhaps insensitive tonally. Some of them were so beglamoured by the entire building that they just knew everything must be right. What is missed is people can no longer hear Aurore [Link's reference to Arturo Toscanini] hum or Koussevitzky will now be forced to stand in front of his orchestra rather than sit in the hall and be able to judge and listen what the audience should hear.

On November 2, 1940, Link wrote Saarinen and explained that Sabine had objected to the perforated Flexwood on the walls but Potwin insisted, and now it was too dead. She emphasized how the hall was still thrilling until the carpet went down and how Arturo Toscanini played the piano before the carpet was laid, and afterward it was like putting a heavy mute on a violin. Also, she noted Marion Anderson's concert was beautifully delivered but failed to thrill people. One person said, "Of course the hall's acoustics are wonderful, but why doesn't she let her voice out?" Another said, "I believe Miss Anderson is using that mezzo voice in imitation of her rival, Dorothy Maynard." Link explained how Arthur W. Quimby, a keyboard virtuoso and musicologist in whom she had great confidence, found the hall in need of improvement. On November 5, 1940, Sabine wrote Link:

I do not suppose a new hall was ever built in which the acoustics properties fitted all tastes. The acoustics of concert halls come to be a matter of tradition, and I still have hopes that this will be the case with the Kleinhans Hall. I know there are a great many musicians who insist upon the support which a highly reverberant room gives to voices and orchestral ensembles. There are, I think, an equal number who prefer the clarity and nice annunciation of less reverberant rooms. The result is that the acoustical engineer has to steer between Cylla and Chivytis with the usual result that one group, or the other will insist that he has landed on the rocks.

Paul continued,

I have observed so many times where acoustical reputations, either good or bad, are made in the early history of a concert hall, and popular opinion once formed seems not to be subject to change either with, or without, notice. I should like to see the new hall after the test of time and to know the spontaneous reactions of orchestra leaders and enlightened listeners before definitely deciding that we "pulled a boner," and certainly before making any attempts to alter the conditions.

Will the Full Carpet Expediter Please Rise?

On November 29, 1940, Sabine asked why the floor was completely carpeted? "All my calculations and specifications were based on carpets in the aisles only."

Sabine learned that Potwin was also surprised when full carpeting was specified. Carpeting under the seats undoubtedly made a marked difference in conditions in the empty room or when partly filled. Only when completely filled would the carpeting not have the same effect. On June 3, 1941, Link wrote:

Our friend, Stokowsky, was charmed with the hall in all respects except the acoustics. The local acoustician was quoted in the newspaper as the reasons why there was a lack of reverberance in the hall. Nelson Eddy approved the halls acoustics. Thus his comments were printed. Marian Anderson and Kirsten Flagstad who found the hall dead were not given any publicity. The directors know that not everybody considers the hall's acoustics ideal.

Here is Leopold Stokowsky's reaction to the hall:

Most enthusiastic about the whole hall, saying that for once simplicity was almost achieved. Keen about the dressing rooms, other creature comforts.

Acoustics: Stokowsky went all over the hall, platform, downstairs, and balcony, clapping his hands and listening for the reverberation.

Hall too dead, result no ensemble, reverberation too short.

(1) Objected to perforations on side walls.

(2) Objected to carpet.

Loss of sound (1) through holes in ceiling. (Asked me if we were playing for the sparrows). (2) Objected to fins, especially on stage, felt side walls, back wall, and ceiling of platform should be unbroken.

His conclusion was that inasmuch as the place is finished there is nothing to do now, although he did speak of a kind of rubber that could be put under the seats which would be much less absorbent than carpet and yet would dull the impact of any late-comer's feet.

I spoke with students who were in the rehearsal who were not playing, and they said that they could hear no ensemble, they all felt as though they were soloists; moreover, they could not hear the instruments in the different choirs of the orchestra.

One newspaper said that Stokowsky did not use his shell because he said the acoustics were good enough, but the assistant conductor told me that it was only because of the physical difficulties in putting it up on our platform that they were unable to use it.

On June 5, 1941 Sabine wrote, "I cannot find who was responsible for carpeting the floor. It would indeed be fun to come to Buffalo for a concert and I think very illuminating to get the effect which ERPI's patchwork treatment gives."

End of the correspondence in the file ... end of project.

It is somewhat difficult to comprehend that throughout the construction phase, Paul Sabine was never asked to visit the site or funded for his advice during the construction. In fact, from all indications, he never actually saw the Kleinhans Music Hall, but he became known as the leading acoustical consultant on the Kleinhans Music Hall Project, a semantics trick that worked to the advantage of others; soon after the hall opened, Paul Sabine learned from oth-

er sources that he was credited as the consultant responsible for providing the dead hall. Although he explained his actual part in the project to many, he was never able to reverse what had spread throughout the country and, in turn, saw his reputation as a consultant irreparably damaged. Ironically, he, like Wallace Sabine, had stopped consulting to do war research.

An interesting follow-up regarding Charles C. Potwin is included here. After his death on September 25, 1941, the editor of the *Journal of the Acoustical Society of America* inserted a page titled Charles C. Potwin. The page appeared in *JASA*, 13(3):319. The write-up was typically complimentary, and mentioned the many accomplishments achieved by Charles Potwin. Besides his many work-related achievements Potwin became a Fellow of ASA and also served for a short term as ASA treasurer. What is interesting is the editor's comment about Potwin's contributions to the work on the Kleinhans Music Hall project:

Serge Koussevitzky, conductor of the Boston Symphony Orchestra, said "Never have I found any music hall so perfect acoustically."

Apparently, Serge Koussevitzky felt entirely different about the Kleinhans Hall acoustics than did Ester Link, Leopold Stokowski, Arturo Toscanini, and the critics. Which only adds fuel to the fires of acoustical consulting.