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Acoustic & Vibration Solutions

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Representative Papers & Presentations - Hugh Saurenman, President

Final Report ATRC Project SPR 555 Atmospheric Effects Associated with Highway Noise Propagation. (Saurenman et al)

Final Report ATRC Project SPR 555 TOC & Executive Summary (Saurenman et al)

Tire Noise Ramification of Pavement Characteristics. (TRB Presentation/Saurenman & Garrelick)

Research Notes Atmospheric Effects Associated with Highway Noise Propagation. (Saurenman)

Noise Parametric Studies (Saurenman) and Tire Noise Ramifications of Pavement Characteristics. (Garrelick)

Forum Acusticum: Highway Noise Levels in a Suburban Environment (Chambers & Saurenman)

Atmospheric Effects on Propagation of Highway Noise Arizona DOT (TRB Presentation 2005/Saurenman)

Highway Noise Levels in a Suburban Environment Under Inversion Conditions (Summer 2005 TRB Presentation/Chambers & Saurenman)

Atmospheric effects on sound propagation (Summer 2005 TRB Presentation/Saurenman)

Ground-borne Noise and Vibration in Buildings Caused by Rail Transit. (APTA September 2006 Presentation/Zapfe, Saurenman & Dennis)
 Status: TCRP Project D-12 Ground-borne Noise and Vibration in Buildings. (APTA June 2006 Presentation/Saurenman & Dennis)

In Service Tests of the Effectiveness of Vibration Control Measures on the BART Rail Transit System (ASA/INCE Presentation October 2005/Saurenman)

In Service Tests of the Effectiveness of Vibration Control Measures on the BART Rail Transit System (IWRN Presentation October 2004/Saurenman & Phillips)

In Service Tests of the Effectiveness of Vibration Control Measures on the BART Rail Transit System (Saurenman & Phillips)

High Speed Rail Ground-borne Vibration Test Results (APTA Subcommittee meeting 1996/Saurenman)

Noise, Vibration and EMI from Modern Streetcars. (Presentation TRB January 2007/Saurenman & York)

Historical Perspective of Vibration Prediction in North America (TRB Workshop on Ground-borne Vibration Jan 2006/Saurenman)

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ATS Consulting
acoustics, transportation - strategy

HUGH SAURENMAN, PHD, PE – PRESIDENT

Founded ATS Consulting in 2001

Education

Ph.D., Mechanical Engineering, Tufts University, Medford, MA

M.S., Mechanical Engineering, Tufts University, Medford, MA

B.S., Engineering, Harvey Mudd College, Claremont

Registration:

Registered Professional Engineer (mechanical) California #18313

Registered Professional Engineer (mechanical) Washington #51915

Affiliation:

Frequent contributor to the APTA Track/Noise and Vibration Technical Forum

Chair of TRB Committee ADC40 on Transportation-Related Noise and Vibration (2014 to 2020)

Member of the Acoustical Society of America, American Society of Mechanical Engineering, Institute of Noise Control Engineering, and AREMA

Professional Experience

Dr. Saurenman is an internationally known expert in issues related to transportation noise and vibration control with over 40 years of experience. He has played an integral role in the development of transportation infrastructure and improvement of transit systems throughout North America and around the world. Through rail projects, research programs, and participation in national and international forums, Hugh has developed a thorough understanding of transportation noise and vibration issues.

Recent Project Experience

Regional Connector Transit Corridor —Regional Connector Constructors, Los Angeles, CA, (2014-Current): Dr. Saurenman managed the groundborne noise and vibration final design for the Regional Connector, a light rail subway corridor through Downtown Los Angeles to connect the Blue and Expo Lines to the current Gold Line and Union Station. The alignment passes under 2nd Street in close proximity to the Walt Disney Concert Hall and the Colburn School of Music. As part of the Design Build Team, ATS performed ground vibration propagation studies between the location of the subway tunnel invert and the performing arts and recording spaces within these buildings. ATS prepared the vibration mitigation design of the trackwork and the detailed final design of the floating slab track that was recommended to meet the stringent noise and vibration criteria for the Disney Concert Hall and Colburn School of Music.

Exposition Corridor Light Rail Project, Exposition Construction Authority, Los Angeles, CA (2006-2018): Dr. Saurenman directed noise and vibration studies for the Draft EIS/EIR and Final EIR for Phase 2 of this project and directed on-call tasks for Phase 1 that opened in 2012 and for Phase 2 that opened in May 2016, and provided on-call services to address issues that developed after Phase 2 opened. The Phase 2 alignment passes close to a number of residences and there was considerable concern about potential noise and vibration impacts. Because of threatened legal actions from several community groups, the studies were more comprehensive and more thoroughly documented than normal. Dr. Saurenman's work on the Expo Phase 2 project included evaluating potential impacts from vibration, groundborne noise, and airborne noise to a number of recording studios and screening room facilities adjacent to the corridor. The facilities included: Todd AO, a post-production audio facility; Grey-Martin recording studio; Groove Master Studio (Jackson Browne); an IMAX facility with several screening rooms; Dick Clark Studios; and several other recording facilities.

Hugh also directed various on-call studies during the construction of Phase 2 including reviewing noise and vibration survey reports prepared by the construction team and assisting the Expo Construction Authority respond to questions and threats of litigation by various stakeholders adjacent to the Expo Phase 2 corridor. The supplementary studies performed after completion of the FEIR included detailed vibration studies and specification of vibration mitigation for six additional recording studios located adjacent to the Expo alignment.

The extension opened in 2016 and ridership has been greater than expected. As a result, Metro decided to reduce the headway between trains and increase the train length to three vehicles. There also were complaints from the eastern end of the alignment regarding "singing" rail and wheel squeal. Hugh has directed studies to determine whether the proposed Metro changes in schedule and train lengths will cause noise levels to exceed the impact thresholds that were used for in the EIS/EIR and to find solutions for the noise issues.

Central Corridor Light Rail Project, Minneapolis/St. Paul, MN (2008-2010): Hugh directed numerous vibration studies for this project to assess potential impacts and recommend mitigation measures. Vibration impacts to sensitive receptors became a major issue during the FEIS phase of the project. Concerned stakeholders included Minnesota Public Radio (MPR), Twin Cities Public Television

(tpt), the University of Minnesota, the State Historic Preservation Office, two historic churches, and others. Hugh's participation included a number of meetings with stakeholders to discuss potential vibration impacts and mitigation measures that might be used to minimize the impacts. The vibration studies included approximately 30 vibration propagation studies, a demonstration of the accuracy of the vibration propagation prediction procedure, an assessment of how wheel condition affects vibration levels, and several force density tests. The technical memorandums withstood intense scrutiny by several other vibration consultants.

Sound Transit University Link Verification Measurements, Seattle, WA (2017-2018): This project was a follow-on to the U-Link study performed in 2015-2016. The Northgate Link alignment passes through the UW campus and is in close proximity to a number of research facilities. For this project, accurate vibration adjustment estimates were required out to distances more than 2,000 from the vibration monitoring positions in the tunnels. ATS Consulting was the prime contractor for this project and Hugh was the Project Director. One of Hugh's roles was to ensure that the lessons learned in the U-Link study were applied to this study. Through the use of relatively large shakers, data collection using sine dwell at specific frequencies, and use of a wireless data collection system that recorded data from up to 20 monitors distributed across the UW campus, accurate transfer function data were collected. This allowed calculating final vibration adjustment estimates and 95% confidence intervals for the final adjustment estimates. With the adjustment estimates and known confidence intervals, it was possible to say with confidence that the vibration limits are very unlikely to be exceeded when Northgate Link opens in 2021. A final phase of this project will be to perform measurements after Northgate Link is operational to verify that the vibration adjustments are accurate and that the vibration levels do not exceed the agreed upon limits.

Bay Area Rapid Transit (BART) System Rail Corrugation Tracking, San Francisco, CA (2010-current): Since 2010 ATS Consulting has been tracking the formation of corrugation on the BART system using noise measurements inside the operator's cab of the trailing vehicle. Systemwide measurements have been performed at intervals of approximately six months. Initially the results were provided to BART staff as spectrograms in PDF format of the noise between each station pair. This quickly became a burden to manage so ATS developed a web-based application to manage and display the noise data, which we named OnTrack. The results have been used to identify problem areas and to prioritize the rail grinding. At BART's request many features have been added to OnTrack. These features include displays of the rail gauge face and rail head wear, when the rail was ground, and graphs of data from a number of sources on a single display to help identify trends. The BART implementation of OnTrack is currently being updated to display track fault data from ultrasonic rail measurements.

OFFENHAUSER/MEKEEL ■ ARCHITECTS

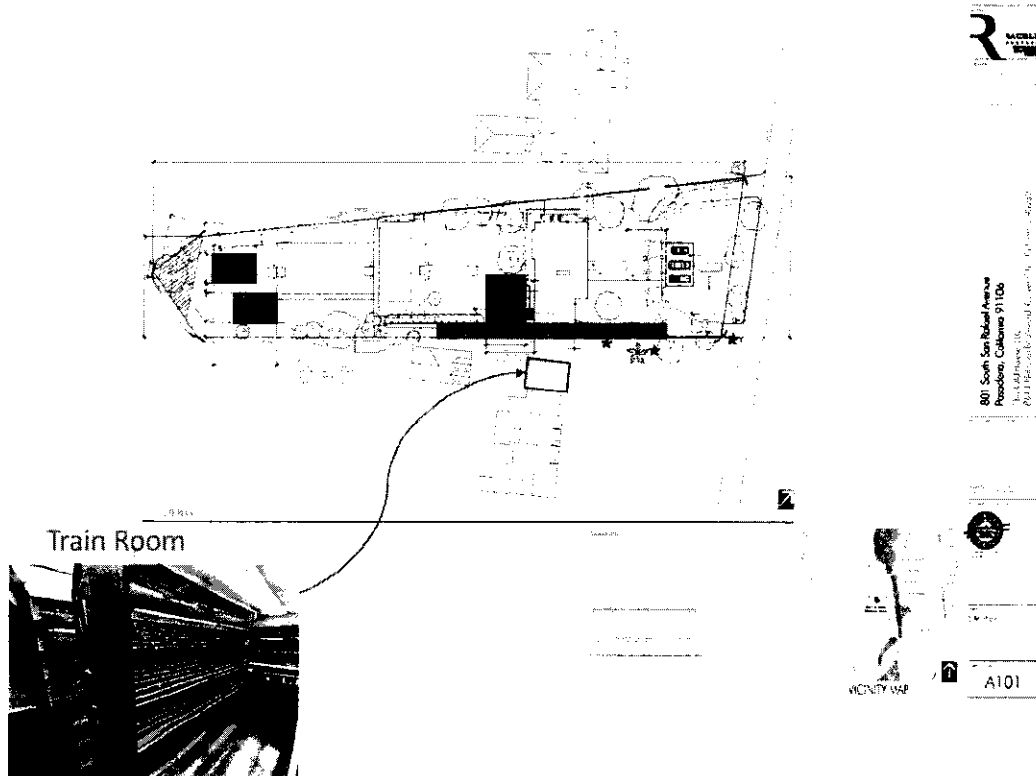
Roxanne Christ-DeWitt
815 So San Rafael Ave.
Pasadena, CA 91105

Jan. 24, 2021

Re: Construction at 801 So San Rafael

Dear Mrs. DeWitt:

You have a museum-quality model train collection in a dedicated train room on the west end of your house. You have shown me how delicate individual train models are, and how damaging vibration and migrant dust can be. You have also shown me the proposed site plan for the project on the neighboring property in relation to the train room:



Here are my observations based on my experience:

What are some common demolition, excavation, foundation and construction methods that may damage the collection?:

- Soils compaction for new foundations using tamping vibration rammers
- Sledgehammering building materials
- Jackhammering concrete/footings/paving using pneumatic breakers
- Throwing concrete and building materials into a “low boy”
- Lumber and other deliveries that “drop” materials from a truck bed
- Driveway use by heavy machinery—driveway is no longer smooth so will cause vibration
- Dumpsters with metal wheels

How can demolition, excavation, foundation and construction be done which lessens that danger? I have seen the following methods implemented, and I recommend them here as project conditions that the city imposes:

- Conventional footings rather than compacted bed of fill: Conventional footings, hand excavated, with concrete pumped from street are accepted by the projects’ soils engineer. These eliminate vibration from tamping vibration rammers or other pounding compaction methods. (It also minimizes migrant dust).
- “Hand wrecking”—no impact tools: Demolition of an existing building can be achieved without impact tools—without sledgehammers, jackhammers, long crowbars, etc. Impact tools are customarily banned when damage to the other parts of a structure that are not being demolished must be minimized. Those customary procedures can be used here.
- “Hand wrecking”- disassembly: We are finding more and more demolition contractors specialize in disassembly, so that building parts can be lawfully recycled. Disassembly can be used in your instance to minimize potential vibration and damage.
- “Diamond sawing”: Concrete and paving can be removed in 2x2 feet pieces and wheelbarrowed away, using a diamond saw with water. (Other non-vibrating methods are thermic lancing and pressure bursting, but I don’t have personal experience with those). Concrete should not be sledgehammered, and after sawing can be taken in smaller pieces to a low boy at the street.
- Deliveries farther away from 815 San Rafael: Lumber dropping, rebar delivery, and other deliveries can be limited to the west side of the property furthest away from 815 San Rafael.
- Tires on equipment: No metal wheeled equipment or dumpsters should be on site. If they go over bumps there will be vibration. Normal tires on backhoes etc can be damped as they move on pavement.
- Take structural and hardscape pieces away in large sections and demolish elsewhere. This may sound unusual, but it is actually practiced and may be preferable.

How to avoid damage and ensure compliance: At construction projects next to museums and othe sensitive sites, often cities place project “conditions” on the project to limit and monitor vibration levels to prevent damage. The following are recommended as conditions of approval to be imposed:

- a. Limit vibration to levels that are generally considered effective and safe to prevent damage from construction projects to the contents of neighboring museums with fragile contents, or the level specified by a retained vibration engineer who has reviewed this particular situation, if available.
- b. Install wifi-based monitoring system to continuously measure vibration levels and to automatically notify recipients via SMS (text) and email monitors when defined thresholds reached. Vibration records to be maintained on server and reviewable on website on an ongoing basis. Stop work threshold at the specified maximum vibration level and a warning level somewhat below that.
- c. Warning threshold alert to be sent to developer and 815 property owner and seniormost city inspector), and stop work threshold alert to be sent to all three of the above plus senior planning department officials.
- d. Immediate and automatic building department stop work order takes effect if the stop work threshold is reached.
- e. All work remains stopped until 815 property owner's vibration engineer analyzes the data, determines the cause, developer proposes a work-around and engineer notifies City Of Pasadena Building Department it's ok to restart. Stop work protocol starts over if vibration thresholds are again triggered.

Migrant dust from the project on the neighboring property is also a risk. I understand that you have taken precautions using museum-type standards to keep migrant dust out of the collection room—a combination of special HEPA air filters inside theroom, walling the sytem off from the whole house HVAC system, caulking and weatherstripping and taping over all openings. Etc.

There may be instances where your protections aren't enough, when a confluence of conditions happens due to construction next door. I have seen this happen, and am aware of some precautions that can be taken at the construction site to prevent migrant dust.

What are customary methods which can be used next door to minimize migrant dust on the collection?

- No stockpiling of dirt on site—dirt excavated must be removed in the same day.
- Any conveyance—wheelbarrow, stakebed, truck, lowboy – carrying dirt or debris must be covered with a tarp
- Excavation or demolition areas should be sprayed down with water periodically.
- No sandblasting
- No deliveries dropping materials – causes vibration but also sudden dust.
- We already mentioned moving certain operations away from your property to prevent vibration effects. This is also desirable for preventing migrant dust, such as taking the garage building away in large sections and demolishing elsewhere, and sawcutting paving and breaking it up elsewhere.
- Barriers from any spraying operation

Museums have special ways to carry and transport museum objects, but their first dictate is "don't move the object". Vibration control/minimization is essential for the train collection. Moving it is not an option.

Sincerely,
OFFENHAUSER/MEKEEL ARCHITECTS

A handwritten signature in black ink, appearing to read "Frances Offenhauser". The signature is fluid and cursive, with the first letter of each word being capitalized and prominent.

Frances Offenhauser

FRANCES A. OFFENHAUSER, Principal



Education:

Bard College, Bachelor of Arts (1972)
Massachusetts Institute of Technology (MIT), Master of Architecture program (1972-76)
University of California at Los Angeles School of Architecture and Planning, post-graduate courses in construction administration, development and financing.

Registration:

Registered architect in California.

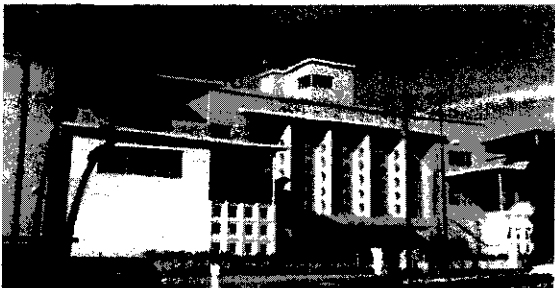
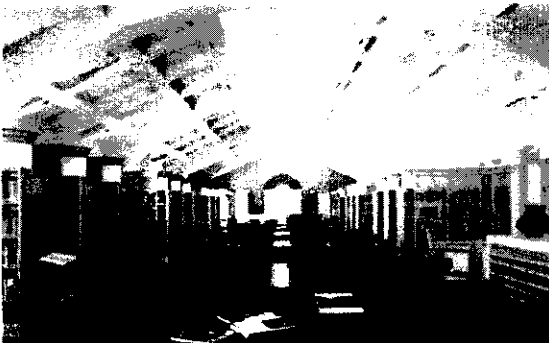
Experience:

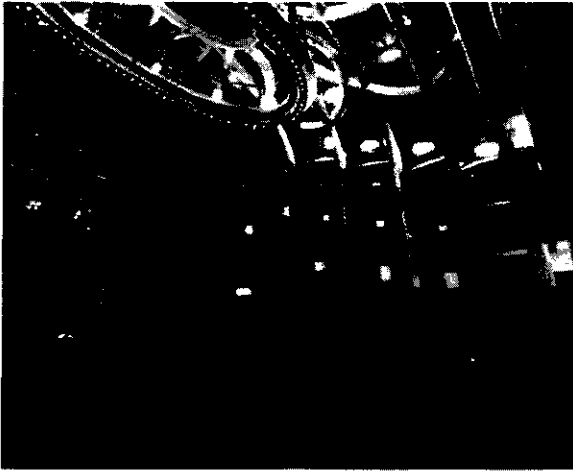
Frances Offenhauser has built a significant practice in California, restoring landmarks from major public buildings to private estates. This starts from her love for and knowledge of the region's architectural styles. Her firm has extensive experience with the specifics of these historic buildings - their styles, ornament, massing, structural design, retrofit needs, archaic materials, compatible landscape and interior design, fancies, and flaws. This knowledge carries into the firm's restoration and new construction work.

Frances Offenhauser's architectural practice draws on 40 years of experience in every aspect of construction - from large scale master planning and entitlements, to real estate development, to building design, to construction contracting. Her award-winning work combines strong aesthetics with a practicality won from having worked in every role in the building team.

Hollywood-Based: With an office in West Hollywood, most of the firm's work is in Southern California, centered principally in Hollywood. Ms. Offenhauser was a founder and remains a Board Member of Hollywood Heritage, which for 35 years has been the voice of historic preservation in Hollywood. The Community Plan and zoning which are the laws in effect in Hollywood today are her work—stemming from the years when she worked at Gruen Associates.

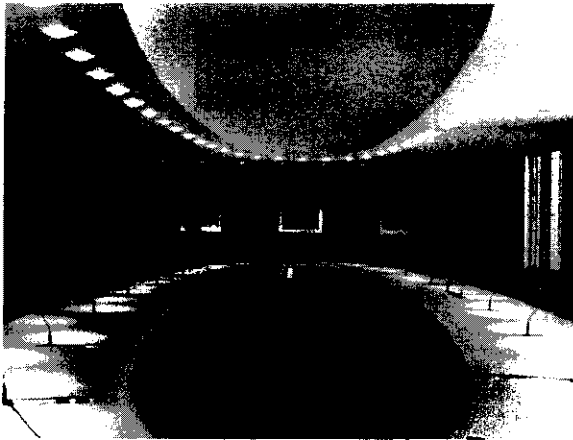
Luxury Market: Her firm has built and renovated many luxury homes and estates in the Los Angeles area for clients from the film, music, and related industries. Much of this work is confidential, but the firm recently completed the first-ever private IMAX Theater in the world as a part of an estate in Beverly Hills.





Academy Projects: For the Academy of Motion Picture Arts and Sciences, Frances Offenhauser transformed the derelict Spanish Revival "Beverly Hills Waterworks" into the Fairbanks Center for Motion Picture Study – the world's premier library of print materials about film. She brought a unique background of hands-on construction experience combined with large scale project management experience to this difficult project. Construction was competitively bid and built with only 1% change orders.

The 40,000 sf library includes reading and research spaces for patrons; archival storage for photographs, print files, scripts, posters, etc; collections processing; reception and conference space; and librarian offices. Recently OMA added a video wall display.



From 2001 to 2013, Ms. Offenhauser master planned and transformed another historic building for the Academy's archival uses – this time the post-war concrete "Mutual Don Lee" television studios, which were curiously well-suited for film vault use. Ms. Offenhauser led the team of specialists in developing state-of-the-art film vaults, preservation workrooms, offices, conference rooms, and the Linwood Dunn Theater in this 120,000 sf Hollywood building. The existing building is being expanded to 175,000 sf, within its original shell.

Ms. Offenhauser represented the Academy with the developer for the "build-to-suit" \$90 million first-ever live broadcast theater in Hollywood. Offenhauser and her staff prepared the Kodak Theater project program; negotiated the complex lease agreement; and coordinated consultants and telecast production staff in reviewing plans and specifications for suitability for the theater live broadcast, the arrivals sequence, the press rooms, and the Governors Ballroom.



For 30 years Ms. Offenhauser assisted the Academy in successive renovations of its headquarters office building, including creating a new Board Room in a fast-tracked schedule. In one stretch, she renovated the executive office floors while the group was producing the Academy Awards.

Landmark Projects: Ms. Offenhauser directed design and construction as architect for many of the region's most important landmarks shown here:

- **Los Angeles Union Station:** Upgrades to landmark train station to improve the pedestrian experience in the waiting area, tunnel and rest rooms, including new signage, lighting and landscape restoration at the South Patio and studies for new First Class Lounge and retail court.
- **California Science Center:** Total reconstruction based on a photograph of the missing section of the 1910

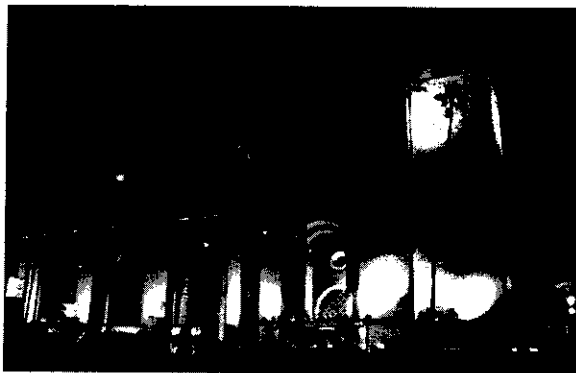


terra cotta/brick/cast iron historic entrance facade at the California Science Center in Exposition Park, Los Angeles (for Zimmer Gunsul Frasca).

- **Los Angeles Olympic Swim Stadium:** Restoration of deteriorated cast-in-place façade of 1932 Olympic Swim Stadium façade (for Zimmer Gunsul Frasca).
- **Brand Library:** Library planning for 21st century change, and restoration of principal public rooms, for Glendale's storied Brand Library, a specialty library and gallery/concert venue for music and art.

Other Landmark Projects:

- **Culver Hotel:** Certified rehabilitation of this National Register high-rise residential centerpiece of Culver City downtown revitalization.
- **Hollywood Deco Towers:** Façade restoration for two Art Deco landmark cast-in-place concrete office towers in Hollywood, for American Musical and Dramatic Academy and for World of Wonder Productions.
- **UCLA:** Fast tracked renovation/restoration of the historic Chancellor's Residence; seismic retrofit design development of UCLA's Lombardy Romanesque Men's Gym; and concept studies for restoration of UCLA's Clark Library
- **State of California:** Los Angeles downtown Broadway department store (now State Office Building) design development criteria package; the Hotel Norconian resort (now California Rehabilitation Center) seismic bond design criteria package; the Mt. Whitney Fish Hatchery seismic retrofit consulting; and the Santa Barbara Armory seismic retrofit consulting.
- **LAUSD:** L.A. Armory Building in Exposition Park (now Science High School) seismic retrofit consulting.
- **Hollywood Heritage Museum:** Conversion of the Lasky DeMille Barn – a State Historic Landmark and Hollywood's first feature length motion picture studio – to a museum of silent film.



Real Estate Development: Ms. Offenhauser maintains a real estate development business, restoring historic buildings and designing new residences in authentic historic styles.

- Prior to developing on her own, she rehabilitated National Register apartment and hotel properties at Catlett Construction, responsible for all design and employing a fifty-man construction crew. Projects included seven design/build renovations of National Register and locally-designated buildings
- Ms. Offenhauser and her husband Michael Mekeel have bought and saved the home of LA's two-time mayor James Toberman from demolition, converting it to apartments; Tupper Tobias Village, 28 authentic Tudor-styled single family homes; approximately \$10 million of new homes and \$6 million of restored historic homes, among them the Buckland Studios, built by deMille's art director Wilfred Buckland.





New Buildings in Authentic Styles: The firm has built projects in authentic regional styles, or a modern “take” on authentic period styles.

Starting in the 1980’s with the compatible addition of a new wing to the Beverly Hills Water Treatment Plant — transforming it into the stacks and storage for the Academy’s library — the firm brought authenticity to new buildings. California’s regional styles had been lost after World War II by a rush to embrace “international style” modernity. Where they remained - altered beyond recognition in fast food buildings and tract homes - they earned derision.

Some marvelous post-war architecture resulted, but what was lost was craftsmanship, solidity, respect for context, appropriateness of materials to our region and a thorough grounding in Western culture, ornament, and symbolism.

- **Execuflyte/Peterson Aviation:** The firm designed a fixed-base operation (private airport) at Van Nuys Airport, with 100,000 sf of hangars including a Bell Helicopter maintenance facility. The owner wanted customers to know they had arrived in the Golden State, and a new Spanish Revival building with an observation tower welcomes them. The facility handles up to 727s.
- **Mercury Aviation:** A fixed base operation with hangars was also designed by the firm for Mercury Aviation at Burbank Airport. With a nod to the Pan Pacific Auditorium, a landmark project of the partners which was sadly lost to a fire, Mercury has lines referencing streamline modern and holds all the varied support services and amenities for pilots, crew, and clients.
- **Biola University Cinema and Media Studies Building:** In 2016 the firm was selected to design the 52,000 sf film production building at Biola University. Not a typical classroom building, undergraduates train in studio production work with a hands-on curriculum. The building puts recording studios, sound stages, post production labs, screening and QC rooms, and a Dolby Atmos Screening Theatre in an on-campus building. The site was not advantageously located, so a new Arrivals Court creates a signature space for South Campus and puts media production between the new Business and Science schools.

Offenhauser/Mekeel Architects is amongst a growing nationwide group of architects who work from within historical styles, with sophisticated understanding of the styles, and proper adaptation to today’s needs and building types.

**Fred Hill
The Original Whistle Stop
2490 E. Colorado Blvd.
Pasadena, CA 91107**

January 5, 2020

Roxanne Christ-DeWitt
815 S. San Rafael Avenue
Pasadena, CA 91105

Dear Roxanne,

You have asked me to describe the model train collection assembled by your late husband, Robert (Bob) DeWitt (the "DeWitt Collection") in connection with proposed construction at the property next to the "train room" in your house that contains the models (the "Train Room").

My Expertise and Knowledge of the DeWitt Model Train Collection

I own and operate the Original Whistle Stop, one of the nation's largest and oldest model train stores, together with a robust online business. I also own and operate Coachyard, a company that commissions the manufacturing of, and imports, model trains. I have been in business for over 40 years.

On numerous occasions I have been asked to appraise collections of model trains and to render my informal and formal opinion of the attributes of various collections.

I have detailed and first-hand knowledge of the DeWitt Collection and the individual models in the collection as well as the room containing the collection and how they are displayed. From the earliest years of his collecting, Bob consulted me regarding the train models he acquired or wished to acquire and the rarity, cost and value of those models. I knew Bob and his collection starting earlier than 1973, when he first bought your house. In fact, one of the reasons he bought the house was because it had a guest room that could be used to display the DeWitt Collection, as it grew over time.

The DeWitt Collection

The model train collection that Bob amassed is world-class, irreplaceable, extraordinarily fragile and very valuable.

All of the models in Bob's collection are brass and HO scale. Most locomotives and many passenger cars have been custom painted and weathered by Jerry Spoelma. Jerry is one of the world's most renowned model train artists. Given that Jerry is 82, his painting and weathering of models in the DeWitt Collection can never be repeated.

The Collection is World Class

The DeWitt Collection is one of the most extraordinary collections of HO scale, brass model trains assembled by a private collector. I am not aware of any other collection that rivals the DeWitt Collection in terms of comprehensiveness of the railroads it contains, quality, quantity and rarity. In terms of quality, quantity, condition and display, the DeWitt Collection is museum quality.

The Rarity and Irreplaceability of Individual Models and the Collection as a Whole

The models that make up the collection are rare. This is because the manufacturer of each model produced only a limited number of them. Occasionally, there are subsequent manufacturing runs of a few of the models, but subsequent runs are never identical to earlier runs. Moreover, several of the companies that manufactured the models in the collection are no longer in business.

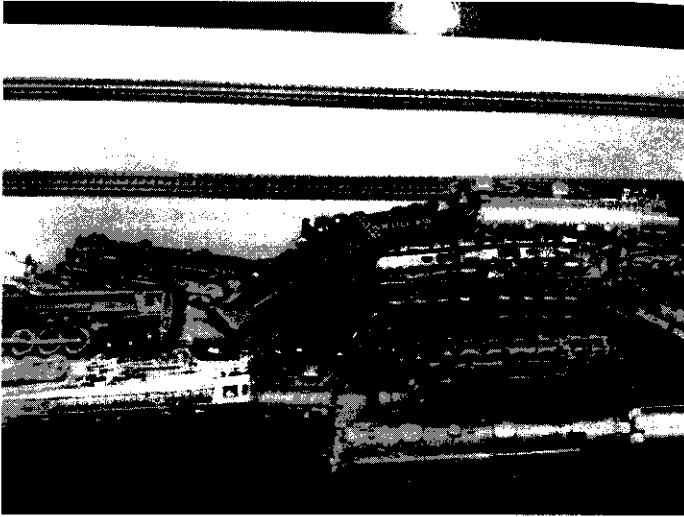
Even if, over time (and it would take a *very long* time), one could locate other models from the particular manufacturing runs in Bob's collection, the collection as a whole could never be replicated. Bob assembled the collection over more than 50 years. It is, in a word, irreplaceable.

The Fragility of the Models

As you know, the train collection is housed in your "train room". The train room contains about 2,250 (two thousand two hundred fifty) linear feet of tracks filled with train models.

There is wire installed on each shelf that runs along the front of each track. Bob added this restraint system in hopes of preventing the models from falling off their shelves and suffering catastrophic damage in the event of a major earthquake. The wire was installed in 2007 and replaced plexiglass doors along the front of the cases. The doors had clouded and yellowed over time. More importantly, in the Northridge quake, they seemed unhelpful, as trains fell off the tracks and piled up on top of each other against the doors.

[Photo of Northridge earthquake "train wreck" below]



The restraint system is untested and, while Bob hoped it would stop trains from falling entirely off their tracks, it will not stop them from being damaged if they are jostled or derailed.

Models will likely be damaged even if all they do is get bumped against the restraining wire. The damage will likely be substantial in the case of locomotives and turbines, as these are the most intricately detailed models. While all of the models are extremely fragile, the locomotives and turbines are most fragile. Locomotives and turbines make up over 70% of the collection.

The models contain very small and fragile parts such as lights, whistles, smokestacks, wheels, wheel drivers, windows, doors, engineer cabs, wiring, and dozens of other parts.

In fact, the wiring on locomotives is little bigger than the width of a hair, and is easily disconnected, loosened, bent, or broken. Moreover, the wiring on the models can become entangled with the wire restraint system, and the model can be banged against the nails that hold the Restraint System in place.

The cars making up the passenger trains are hooked together. If one car tips over, the other cars tend to as well, like dominoes.

Parts from the models can fall off. Reattaching and repairing them takes expert skill and is extremely time consuming and costly. Few people have the skill.

Paint on the models chips easily. As noted, most models are custom painted and weathered. They cannot be repainted without great time, expert skill and expense. Painting and weathering an individual model is extremely costly.

Even then, the quality of painting and weathering by Jerry Spoelma cannot be duplicated. As noted, Jerry, now 82, would not be able to repeat this body of work again.

Merely handling a models can devalue them. Each time the models are handled, they risk being marred by fingerprints. The models cannot easily be cleaned. And, even then, cleaning them requires special skill and carries the strong likelihood that the cleaning process will damage them, leading to a nearly endless loop of repairs, cleaning, more repairs and more cleaning.

The models risk being damaged every time they are picked up. One of the reasons the models contained in the collection are so valuable is because they have seldom if ever been handled since they were first placed on their tracks inside the shelves.

Leaving the risk of a model falling off its track aside, when models are jostled even slightly, the wheels can come off their tracks. The photo shows such a “derailed” train.

[photo of derailed train car below]



Each set of wheels on models pivots around a very small pole on the underside of the model that holds the wheels in place as shown below.

[Insert photo of underside]



Each set of wheels consists of several wheels. If a derailed train's wheels are not put back on the tracks, the model can become unbalanced and damaged. It's a bit like parking only one side of a car on a curb. Whenever a model's wheels come off the tracks, they need to be put back on the tracks. Repositioning wheels on tracks is laborious, time consuming and requires special skill.

Damage From Dust

Bob took pains to seal the train room off from dust. It is extremely difficult to dust off a model. Doing so thoroughly will almost always damage a locomotive or turbine, as the brush used to clean often catches in the fine wiring on the model.

Using compressed air to clean the models is out of the question, as it can blow windows in, blow engineers off their seats, blow windshield wipers off, cause havoc with other delicate parts.

Dust that is slightly "sticky" or humid is the most damaging kind, as it cannot just be effectively removed without dismantling, and sometimes, even repainting the model.

Dust covered models are worth far less than clean models.

Pecuniary Value of the DeWitt Collection

The DeWitt Collection is irreplaceable and, in my view, priceless. Nonetheless, in 2015, following Bob's death, I appraised the fair market value of the DeWitt Collection for tax

purposes at []¹. I estimate the fair market value to be no less than that amount today. However, I cannot over-emphasize priceless nature and the irreplaceability of individual models in the collection and the collection as a whole.

Please do not hesitate to contact me if you have any questions or need more information.

Sincerely,

/T. Fredrick Hill/

T. Fredrick Hill

¹ Appraisal to be provided confidentially and separately upon request.