

Proposal
to
First United Methodist Church
Brevard, NC





PART 1: PROFILE

- Hames Pro is the systems contracting/integration division of Hames Music. We are located in Gaffney, South Carolina.
- Our company was founded in August of 1975.
- We have amassed over 1,500 successful installations throughout the southeast.
- We are factory authorized and supported dealers for the components we provide.
- Our in-house and on-site service departments provide ongoing warranty and service support.

Experience

Hames Pro is well positioned to deliver your project on-time and on budget due to our strengths in the areas of financial stability, technical design expertise, and a defined project management process. We are proficient veterans in our industry, with several key personnel having over 30 years experience each.

Quality

Every system is carefully engineered to provide the best value possible for our customers. We strive to provide the best cost versus performance ratio, while never compromising on performance requirements. Systems offered include equipment of the highest quality by only established and reputable manufacturers, with skillful installation, a comprehensive design process, training, and service. Hames Pro provides you with a single-source responsibility for all of your technical production system requirements

System Categories

- Sound Systems • Video Projection Systems • Video Production Systems • Stage and Architectural Lighting Systems and Controls • Evaluation of Room Acoustics • Acoustical Room Treatments

Applications

- Houses of Worship
- Corporate Board & Conference Rooms
- Theatres & Auditoriums
- Classrooms
- Lecture Halls
- Courtrooms



PART II: SYSTEM DESCRIPTION & NARRATIVE

EVALUATION OF SANCTUARY ACOUSTICS WITH RECOMMENDATIONS (Project 1743)

December 21, 2007

First United Methodist Church
325 North Broad Street
Brevard, NC 28712

Upon being contacted by the church, a site survey and on-site meeting were scheduled to evaluate ongoing problems with acoustics and the sound system in the sanctuary. It was conveyed that many individuals of the congregation have expressed experiencing difficulty understanding speech during the worship services, and that this had been a source of frustration for some time. At some point a new sound system had been installed with the goal improving performance as well as aesthetics in the renovated sanctuary, with poor results. Specific issues relating to the sound system will be covered later in this document.

ROOM ACOUSTICS

It should be stated here that there are two forces at work in the sanctuary which impact the ability of the congregation to hear speech clearly, specifically acoustics and electro-acoustics. We shall first discuss the acoustical aspects of the sanctuary. The sanctuary of First United Methodist Church is a beautiful worship space with inspiring architecture. The room is a bit over 100' long, 40' high, with a ceiling 21'-5" high. All surfaces in the sanctuary are hard, with the exception of carpeting in the aisles. Given this information, one would expect the room to be very lively with a generous amount of reverberation, and this was indeed observed to be the case. In normal conversation, it was noted that the reverberation of the room could interfere with normal un-amplified speech if the speaker was located at any distance at all away from the listener. This was also borne out in listening tests with the sound system as the Pastor spoke from the pulpit. Many words were completely unintelligible to those of us present. This is partially due to the inability of the listener to perceive consonants out of the swirl of reflected energy swimming about the room. This energy tends to have a masking effect on new sounds. It is measurable and denoted in percentage form as ALcons (for Articulation Loss of CONsonants). It is desirable to maintain a value of 15% or less ALcons for speech. Other artifacts such as interference from strong echos, ambient background noise, and other factors can also impact speech intelligibility.

On a return visit, measurements were made using a portable computer running EASERA measurement software to evaluate the sanctuary. The measurements corroborated the initial impressions of what was occurring acoustically in the room, and also shed some other interesting light. The rate at which sound decays in a room over time is called reverberation, and is expressed in acoustics as RT60, for the time it takes for reverberant acoustical energy to decrease in level by 60 decibels. We can look at this measure as a broadband average, or zoom in to specific frequency bands. The varying rates of decay across the spectrum can impart a musical warmth or a sterile harshness to sound. Successful rooms where choral and organ music are presented share similar reverberation characteristics, marked by a longer decay time for low frequencies, with a leveling off for the mid band, and a reduction in reverb time for higher frequencies. The result is a room with the desired "warmth" to its sound. The measured broadband average reverberation time in the sanctuary was a bit over 3 seconds RT60. However, this period increased for low frequencies, and also surprisingly increased for the higher range of 3,000 Hz to 5,000 Hz. This is likely due to the proliferation of hard parallel surfaces. Loss of consonants (ALcons) was measured to 26%, which is



unacceptably high. This value indicates that roughly $\frac{1}{4}$ of all consonants will be lost by a listener at the measurement microphone position, which was roughly the center of the room.

RECOMMENDATIONS

Measures need to be taken to reduce the reverberation in the sanctuary to a level that is acceptable for speech, but still supportive of the organ, musical presentations and congregational singing. Music is of great importance to worship, and every means must be employed to ensure that any acoustical changes to this space are done with sensitivity to the musical impacts. The church has a grand Shantz pipe organ for leading worship, and its mission must not be compromised, as well. The sanctuary has an undesirable increase in reverberant energy at the upper end of the speech spectrum which interferes with intelligibility. The recommendations here are intended to only slightly reduce reverberation in the mid to high frequency bands to provide an acceptable level of speech intelligibility. It should be stated here that care has been taken to preserve all that is good about the sanctuary acoustically, and to not make the room a “dead” acoustical space.

I am recommending the addition of approximately 800 ft² of fabric-covered acoustic wall panels. The panels will be 1” I thickness to affect higher frequencies more so than lower. Panels will be distributed as follows:

- (6) 48” X 48” panels on the back wall of the balcony, spaced;
- (4) 48” X 48” panels on the side walls of the balcony;
- (20) 30”W X 8’H panels, installed between each window and the adjacent pilaster.

Please refer to the drawing included later in this proposal for specific panel locations. The panels are fabric covered, and available in any color by Guilford of Maine in their FR701-2100 series. The remaining areas will remain as-is and untreated. It is estimated the recommended coverage will lower reverb times as desired, and help reduce high frequency energy more proportionately. The chart in fig. 1 illustrates the relative difference between the room in an untreated state, and adding the panels. Figure 2 compares projected results by frequency band (using the Sabine reverberation equation).

Figure 1: Comparison of Reverberation Curves

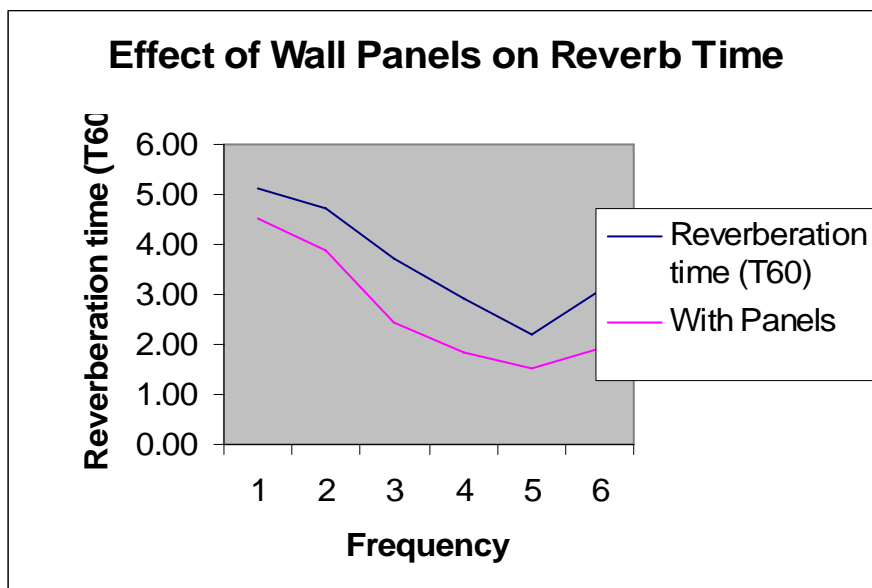




Figure 2: Comparison of Reverberation Time Projections by Frequency

Frequency:	125	250	500	1000	2000	4000	
Reverberation time (T60): (Prior to Treatment)	5.10	4.73	3.74	2.90	2.21	3.08	seconds
Reverberation time (T60): (After Treatment)	4.53	3.86	2.45	1.86	1.53	1.91	seconds

This proposal provides for providing and installing of the panels. Additional measurements will be taken during and after the installation process to verify that the results are achieved as intended.

SOUND SYSTEM

The issues of clarity of speech and general intelligibility are linked closely to the performance of any installed sound system. Design of sound systems is a relatively simple task when working in non-reverberant spaces, but becomes more critical in reverberant rooms, and spaces such as the sanctuary of First United Methodist Church must be approached with care. The single greatest factor in successful deployment of a system design in a reverberant room is speaker directivity, represented as “Q”. Simply put, the higher a loudspeaker’s Q, the more directional it is. It is imperative that speakers be selected and installed so that sound is not unnecessarily striking hard surfaces of the room. Stray sound from speakers can overly excite room reverberation. We also look at the “critical distance”, the point at which direct sound from a speaker and the reverberant energy in the room achieve equal proportions. Ideally, we want to have this point as far deep into the room as possible to maintain the highest clarity for all listeners. This is achieved by either lowering reverberation (as we are with the panels), moving the listener and the source closer together (sometime done with distributed speaker systems), and by utilizing a more directional loudspeaker with higher Q.

The speakers currently installed in the front of the church are typical of conventional speakers, with a high frequency horn/driver combination, and a single low frequency “woofer”. This type of speaker has a Q of about 12, which is fine for a less reverberant space, however its critical distance at FUMC would be about 20 feet away. Anyone seated beyond this distance will have difficulty understanding speech.

This proposal recommends we remove the existing speakers, and replace them with a digitally steerable line array speaker system. These self-powered speakers with internal digital processing provide control of the speaker’s beam size to a high degree, allowing us to greatly increase the above mentioned critical distance. The system is programmed by computer for the specific area to be covered, is very effective at keeping stray sound away from high walls and ceilings. This system is capable of variable beam sizes of a small as 5° vertical, resulting in a “Q” of roughly 83. With the untreated room, that gives us a critical distance of 50 feet from the speaker. Factoring in the added absorption from the new wall panels, this distance is extended to 70 feet. The distance to the back wall from the pulpit area is roughly 66 feet, so potentially every seat will lie within the desired critical distance range for good intelligibility. The balcony will remain covered by the two JBL speakers recently installed, which should serve well. All other existing sound system components are compatible with the new configuration, and will remain. The new EAW DSA series speakers will be installed either between or in front of the square fluted columns just outside the pulpit and lectern.



With their exceptional beam control, the speakers will be able to fire overhead of the pulpit and lectern mics, with a null in the direction below. The speakers will be finished in white. A data sheet has been included in the later pages of the proposal.

SUMMARY

The combination of the added room absorption and the implementation of appropriate loudspeaker technology for the room and usage will yield a substantial improvement in clarity and intelligibility of speech. It is my pleasure to prepare and present the church with this proposal. We at Hames Pro appreciate your consideration of our services, and welcome the opportunity to work with First United Methodist Church to equip the church for effective ministry and worship for years to come.

Respectfully Submitted,

Jim Deal
Hames Pro
Division Director



PART III: ITEMIZED PROPOSAL PAGES

The following pages contain proposal detail of equipment and services to be provided.



PART IV: INSTALLATION AGREEMENT

PROJECT No. 1743 – IMPROVEMENTS TO SOUND & ACOUSTICS

FIRST UNITED METHODIST CHURCH
325 NORTH BROAD STREET
BREVARD, NC 28712

This Agreement is made this December 21, 2007 by and between HAMES PRO hereinafter called the Contractor and First United Methodist Church, hereinafter called the Owner. The Contractor and Owner agree as follows:

1. Scope of Work - Contractor shall furnish all equipment and perform all work necessary and appropriate to furnish and install the systems integration equipment in the facility as described in the attached proposal documents dated December 21, 2007 for project number 1743. The scope of work shall only be modified by a written change order proposal which has been accepted by both parties.

2. Responsibility of Others – The Owner agrees to designate a representative to act as project manager. This individual will coordinate the activities of Owner's internal departments and services required for successful completion of the project. The designated project manager will facilitate communication of project details and schedule with the Contractor. Unless otherwise noted in the proposal, the Owner shall be responsible for all electrical work such as but not limited to AC power, conduit systems, and outlet boxes as specified by Hames Pro. All conduits, duct banks and cable trays needed for cable runs will be free and clear of obstruction and moisture, and supplied with a pull string. All finishes will be supplied as standard manufacturer's finish except as noted. All other work necessary to the completion of the project and not specifically defined in the proposal as being furnished by the Contractor shall be the responsibility of the Owner. Provide Contractor personnel prompt and unrestricted access to work areas for the duration of the project. Project delays due to restricted access to the project site may result in additional labor charges. Provide adequate and secure space for storage of equipment, cable, hardware and tools during the installation. This space will be as close as possible to the work area.

3. Existing Equipment – Hames Pro (the Contractor) will remove all existing audio and video equipment which is superseded by this contract and proposal. The dispensation of said equipment shall be the responsibility of the owner, as is the filling of mounting holes, painting of surfaces and other work of a cosmetic nature resulting from the removal of the existing equipment.

4. Agreement Sum - The Owner agrees to pay to the Contractor for the equipment provided and performance of the work, the full amount of \$31,770.02 as stated in the proposal documents. The final contract amount may be modified only by an accepted written change order proposal order agreed to by both parties.

5. Payment - The Agreement Sum is agreed to be paid as follows: A 30% down payment due upon initiation of this contract. The balance of the project will be billed in a progressive manner as work is completed and as equipment is delivered to the job site. Final payment of project balance is due within thirty days from final acceptance or first beneficial use, whichever comes first. A finance charge of 1.75% per month will be added to any past due balances. Work that must be delayed for reasons beyond the control of the Contractor will be billed in a progressive manner. The Owner shall be responsible for any additional costs incurred by the Contractor due to any post-contract changes or omissions to the building and/or infrastructure.

6. Retainage - Provision for withholding payment of any portion of the contracted amount is not made as part of this agreement. Resolution of post-substantial completion equipment and installation issues will be handled under the warranty provisions of this agreement.

7. Performance Bond – Provision for surety or performance bond is not made with this agreement. Performance bond may only be included with the agreement through a signed Change Order by both parties. Cost of bond will be borne by the customer.

8. Electrical – Work and materials necessary for providing required electrical infrastructure for the systems described in this proposal are not included as part of this proposal and agreement. The Owner agrees to secure the services of an electrician to have all necessary work as specified by Hames Pro completed prior to the installation of the systems.

9. Warranty – The Contractor guarantees all equipment and workmanship provided under this Agreement to be free of defects for a period of one year from the date of final acceptance or first beneficial use whichever occurs first. Contractor will repair or replace, at its option, any defective equipment and will correct any defective workmanship during normal business hours while the warranty is in effect at no cost to the Owner. The Contractor reserves the right to void the warranty at its discretion upon evidence of tampering, unauthorized adjustments to software and system settings. Additionally, this warranty is not applicable in cases of abuse, misuse, neglect, acts of nature, or vandalism.

10. Training - Hames Pro will provide a single three-hour training session on each system for operators after completion of the project. A system overview and instruction on basic operation will be provided. Additional and more advanced training sessions are available.

ACCEPTED BY:

X Contractor, Hames Pro

Date

X Owner

Date