

Designing an Entertainment Room with Performance & Function

Would you like to design an entertainment room with demonstrable performance and lasting value for the client? Home entertainment design has perhaps over-*focused* on the concept of a dedicated home theater room that is replicated on movie-theater style front projection. Front projection is the positioning of the projector overhead with the image shot over and across the top of the room. However, this current form of home theater leaves many homeowners somewhat dissatisfied. Surprisingly, front projection is not the optimum medium for fully realizing the benefits of HD. Why? Because front projection has inherent operational & performance deficiencies, which can best be summarized as:

- blinding beams of light which enter peripheral view area when moving
- claustrophobic room requirement: no windows or natural light
- distractions: hum, noise and heat from the overhead projector
- dimensionally flat, matt-textured image that is easily bleached out by light
- narrow view cone: creating only a few sweet seats
- frustration & annoyance unless everyone always remains completely stationary
- a space usable only with all the lights out

Blue Ocean® is a new form of rear projection technology that allows for very short projection throws (distances). Previous rear projection technologies required prohibitively long projection distances and provided lackluster images. Blue Ocean® is powered by an inert micron particle diffuser cast in the center of a 3/4" thick optical acrylic plate. High optical transmission and ultra-efficient diffusion create amazingly brilliant colors & full bodied 3D-like dimensional images. You really have to see it once to understand the excitement. A room designed with Blue Ocean® will satisfy the dark room, purist videophile, as well provides any homeowner with the most versatile and useful entertainment space in the house. On top of superior optical performance, Blue Ocean® frees the entertainment room from all of the deficiencies of front projection. It's tough too, so durable that we believe it will probably revolutionize the concept of outdoor residential theater entertainment. Blue Ocean® provides full maximization of today's 1080 HD resolution as well as peace of mind in knowing that it will also maximize the higher resolutions of the future: no upgrade needed.

Anthony Vandenberg president of the US branch of Nippura Co., Ltd introduced us to the technology. Not familiar with *Nippura*? You probably unknowingly looked right through their products when you visited America's most popular aquariums such as the Monterey Bay and Georgia Aquariums. Nippura's core technology is creating high optical transmittance (*super clear & safe*) windows. The company is now creating the world's largest aquarium window in Dubai to the tune of 108' x 28' x 3' (*that's right 3 feet thick*). Nippura leveraged its optical precision technique to create a full HD projection screen which is turning a lot of heads in the A/V industry. Recently, Anthony designed and built an entertainment room and outdoor deck theater in a real residence featuring Blue Ocean®. We asked him to give our readers a course in the fundamentals of rear projection sufficient enough for them to confidently design-in on their next project.

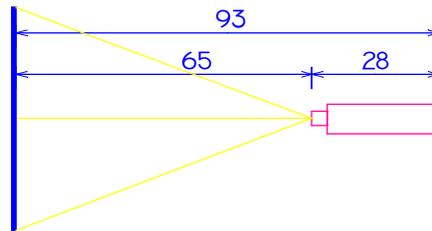
The most common question designers ask me is: “How do I figure the distance I need behind the screen?” Follow the 4 simple rules below and you will confidently and quickly determine your layout needs. In our project we feature a 100” diagonal 16:9 screen (87”W x 49”H) with a Panasonic HD Projector (PT-DW7000U and optional 0.747 wide throw lens). If this is your first design, please feel free to model your screen size on this example and you can’t go wrong.

Rule #1: To calculate the space requirement behind the screen, multiply the width of your screen by the lens throw ratio:

$$87'' \times .747 \text{ Lens} = 65''$$

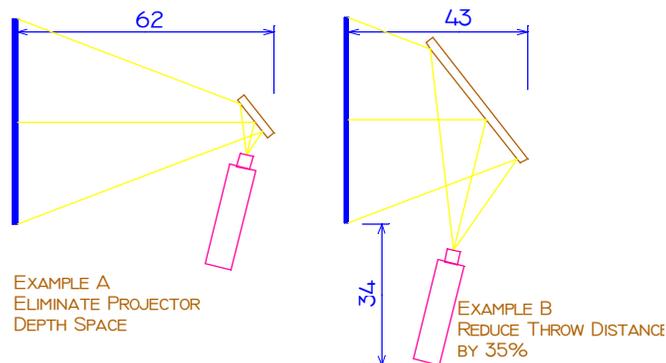
(Remember to use width and not the nominal screen diagonal dimension)

Rule #2: The resultant throw distance is from the back of the screen to the front of the lens, so you must add the depth dimension of the projector behind the lens. The projector dimension we show here is probably the biggest on the market, so you can use this dimension safely for just about any digital projector.



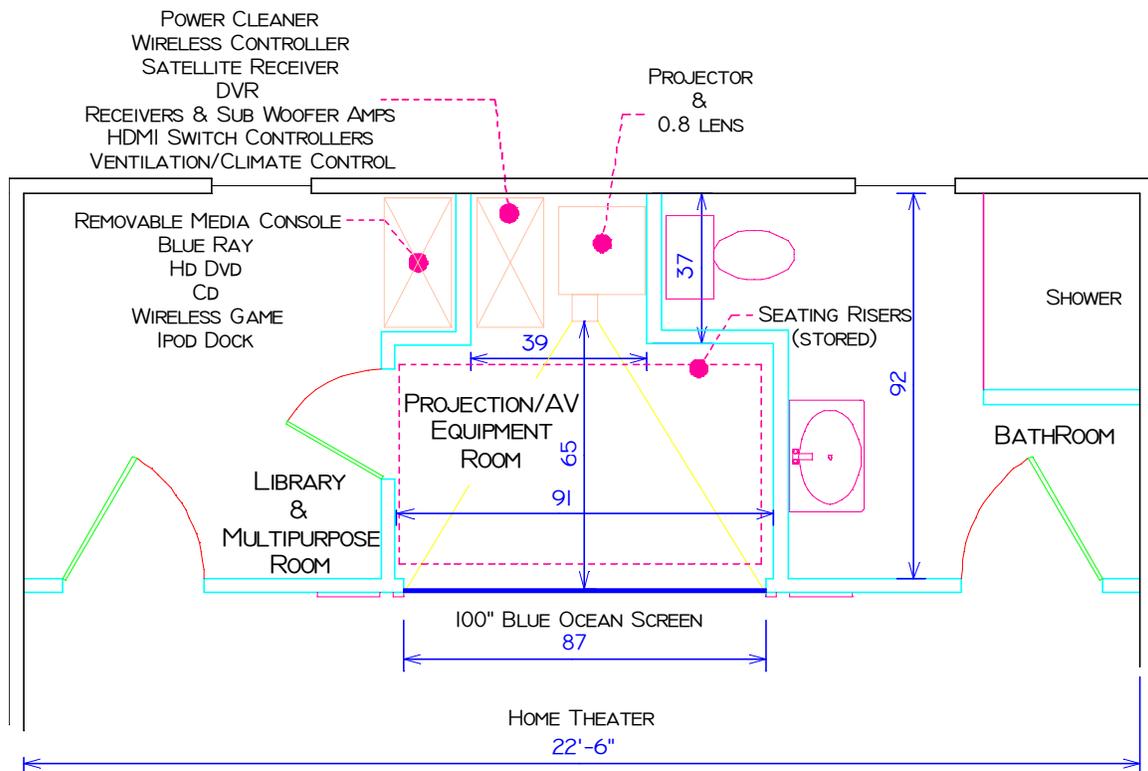
Rule #3: If you need to save even more space, there are other projectors with smaller depth footprints and shorter throw lenses available -- down to 0.64.

Rule #4: The A/V integrator can also install a first surface mirror mount to fold the projection path if you want to eliminate the space of the projector footprint (Ex. A), or if you need up to a 35% reduction in total throw distance (Ex. B).



We simply placed our projector 65” behind the screen in a small equipment room. This closet sized space houses the most vital A/V equipment and accomplishes the goal of total containment of sound, vibration, light and heat. Not only did we remove these malcontents from the entertainment space, we also created an environment where the

equipment can be finely temperature controlled for ultimate performance and longevity. The power cleaner, surge control, wireless controller, satellite receivers, DVR, amplifiers, receivers, and HDMI switcher for the main show room and the downstairs outdoor deck theater are neatly organized on an A/V components rack. The projection room is finished from top to bottom in ultra flat black to create the sharpest blacks and decisive contrast. The critical dimensions for the equipment/projection room are shown in the plan drawing below:



We utilized the floor space just behind the screen as a temporary storage space for three carpeted seating risers (82L"x 48W"x 8H"). When not stored, these risers are placed behind the viewing sofa for additional elevated seating stages at the more populated events. They also make a terrific stage in front of the screen for aspiring teenage musicians. A handheld graphic remote controller provides finger tip intuitive control of the entire system for the main room and the outdoor deck theater. By simply touching the graphic screen, one can control room temperature, lighting, volume, media input, channels, outdoor security cams, intercoms, etc... We designed a removable media console cabinet in the adjacent library to eliminate any need for entering the projection room. This console houses the HD-DVD, Blue-Ray, IPOD and X-Box. We also maximized space on the opposite side of the room by neatly tucking the toilet into a nook alongside the projector alcove. The projection & equipment room occupies a mere 48 square feet of floor space. Hopefully it is evident from the plan just how much value and function can be accomplished with such a small space and coordinated layout.

“What’s the appropriate distance for seating and viewing ... and what about the lighting scheme?” First keep in mind that the entertainment room does not have to become a “dedicated dark home theater” box with draconian rules and formulas. With Blue Ocean® your client will get a brilliant picture with the room fully lit and a better-than-real movie theater picture when all the lights are dimmed. So feel free to design the space for multi-functional purposes.



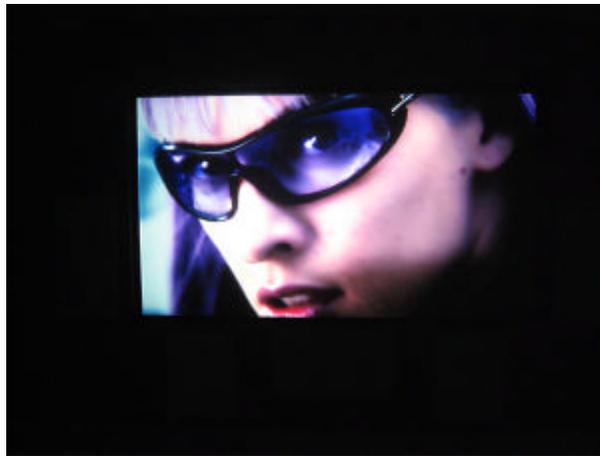
Dimly lit



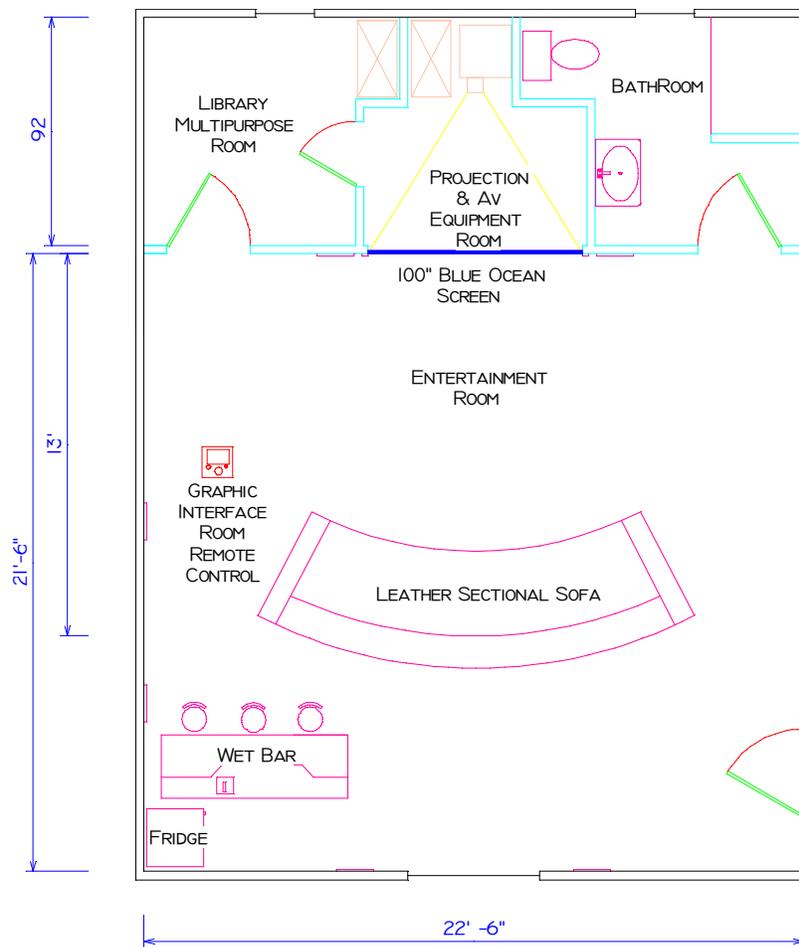
Totally Lit

Before going on any further regarding viewing distance and seating, let me first explain basic HD jargon. The numerals 720, 768, 1080 refer to a fixed number of vertical dots (pixels) that make up high definition images whether it be I or P (interlaced or progressive). A picture with more than 700 pixels is considered standard baseline HD. Each projection technology DLP, LCOS, or 3-LCD has some degree of space between these pixels. When very close to the screen or if the screen is very large, this “pixilation” is evident and distracts from the optical viewing experience. With a 100” screen and standard HD projector, we set our seating back 13’. For standard HD, a safe rule of the thumb for determining your seating distance is using a 3:1 ratio (3” distance for every 1” screen height). With 1080 resolution you can get away with 2:1 but remember that even if all your hardware is 1080, not all of the actual media content watched will be native HD. Another benefit of Blue Ocean® is that the image can be seen perfectly even from extreme seating/viewing angles with no drop in picture uniformity. Because of this, we used a 14’ curved sectional sofa and every location on the sofa provides a perfect view.





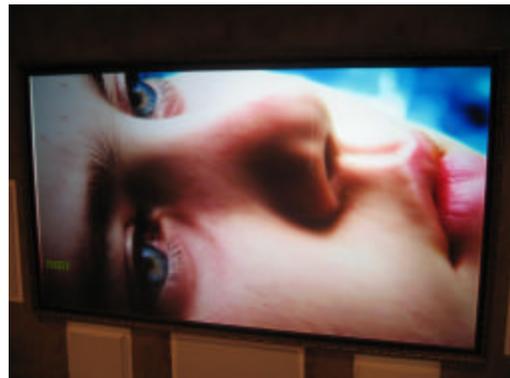
We set the bottom height of the screen at 31', however since there is no vertical view cone limitation with Blue Ocean®, you can feel free to set this at any height suitable for the total room design. *(The image doesn't dim at off angle viewing in either the horizontal or vertical direction)*

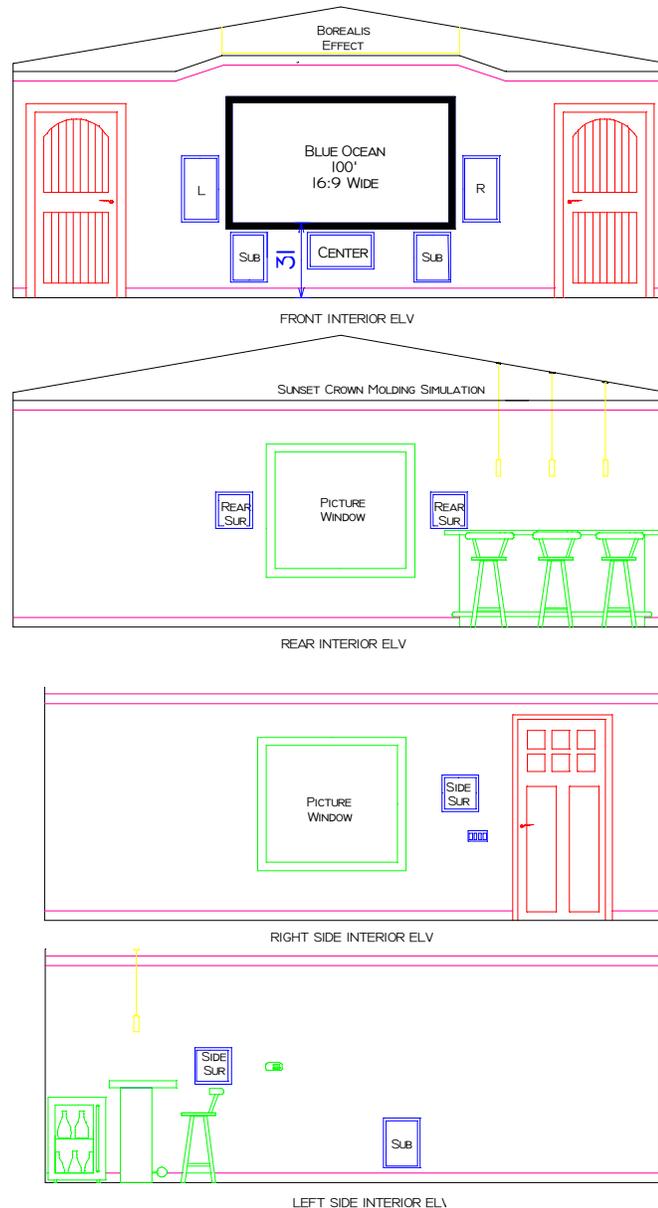


Our entertainment room space has a generous 22'-6" x 21'-6" footprint. The feel is cozy enough for a family gathering on the sofa, and spacious enough to invite the whole neighborhood over for a boisterous Super Bowl party. We added a wet bar, fridge & small kitchenette at the back of the room to fully compliment any hosting situation. We limited the use of hardwood floors to the room entrance and just under the bar & stools, and covered the rest with a deep shag carpet to optimize the acoustics of the room. The ceiling "floats away" from the walls by a cantilevered crown molding, and the vaulted ceiling is painted as a cloud scattered, infinite blue sky. For a little touch of flare, we automated a one touch program that burns a glowing amber sunset above crown molding, dims the lights for pure theater mode, and then sprinkles the night sky ceiling with twinkling star constellations. For fiber-optics, I recommend .5mm diameter fiber cable as this creates the most realistic looking stars and provides invisible terminals even when the room is fully lit in party mode.



It's not all just about sight, I urge you to remember the importance of audio in your design. Place the front center, left, and right speakers as close to the screen as possible. I personally believe that in-wall architectural speakers provide the best balance of audio performance and aesthetic design. We spaced just a few inches from the screen frame to the in-wall speaker frames. Always place your sub-woofer in the front wall, if you are going with two, place the second on the side wall immediately facing your main seating. For your side & rear surround speakers you have much more flexibility in placement as long as you stay within common sense boundaries. I note the locations in blue on the interior elevations for our 7.2 in-wall architectural speaker sound system. Note on the front wall, the left subwoofer is real, and right is just a faux surface screen to create visual balance.





Other key points that need to be kept in mind as you plan the design are listed below:

- Organize your audio and control cable runs in your framing efficiently, remember its best to keep these low voltage wires away from outlet/fixtures wires, never run them adjacent/parallel to power.
- Dedicate at least two 20 amp circuit outlets to the equipment room in addition to code required number of outlets.
- Determine the rough out framing dimensions for the screen mounting by taking your screen size and adding 1" for dry wall dimension (or 1-1/4" for 5/8" acoustic

drywall) and 1/2" for tolerance and expansion. For example with a 100" screen of 87" x 49", the rough opening framing will be 88-1/2 x 50-1/2".



(note the proximity of in-wall black speaker frames to rough opening framing)

- Frame out with typical header made of two 2x8's (minimum).
- The screen has two head mounting tabs that secure to the header via 3/8" threaded rods and the screen sits slightly atop the sill plate stud.
- The screen can be hung flush with the drywall surface, or as in this project we set it protruding 1/2" from the wall so that the groove of the artistic frame hugs along the screen perimeter, and we achieve 99.9% image space on the screen surface.
- The decorative frame or trim around the screen must be at least 2.5" wide to cover the mount transition.
- You can fix your frame without penetrating the front surface of the frame by thru wall screwing from the projection room side.
- Select flat and non reflective finish for your trim framing.
- A 100" 16:9 Blue Ocean® Projection Screen is .89" thick and weighs 158 lbs., so specify installation by at least 2 people. *(Note we also make screen sizes up to 27' x 11')*
- Avoid placing lighting fixtures on wall immediately opposite the screen; these will cause lamp reflections on the surface of the screen atop black/dark scenes.

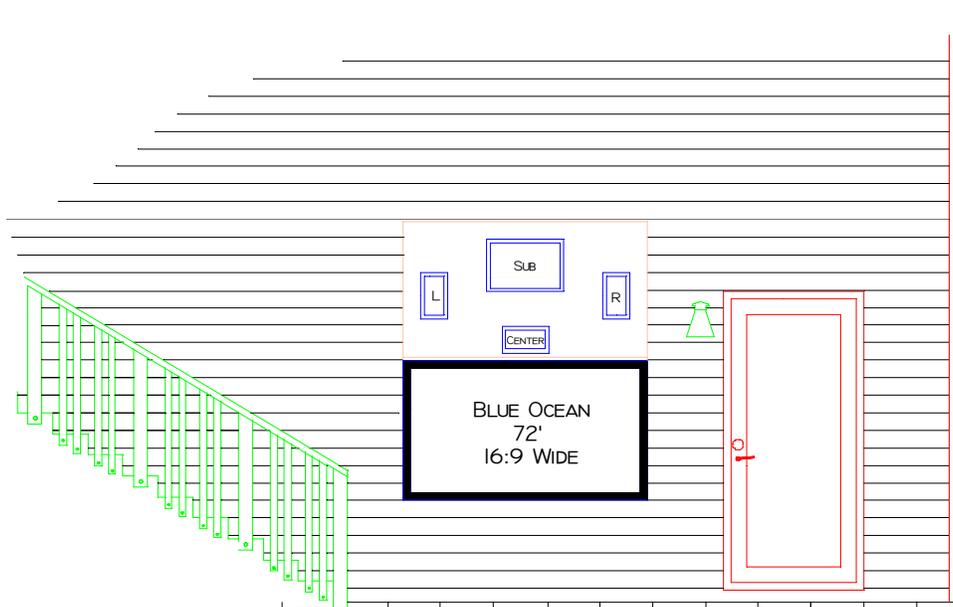


- If design dictates lighting fixtures in reflective locations, design separate control for dimming these lights independently (applicable for purist movie viewing conditions).
- Blue Ocean® is also so rigid that it can be floating frameless application in front of a projection aperture in the wall, but will save that explanation for another time...

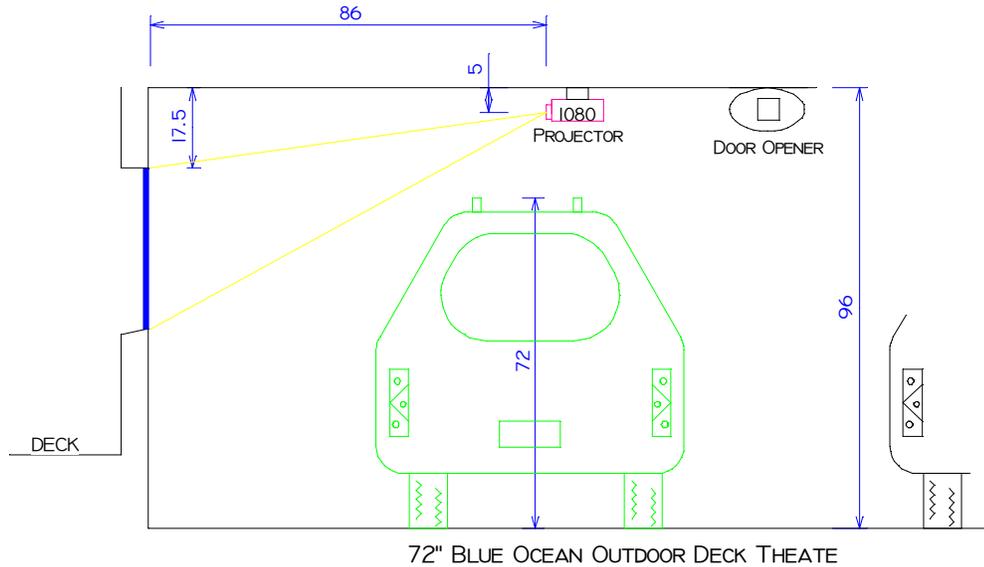


Showroom Outdoor Theater

For our outdoor deck theater we installed a 72" diagonal 16:9 Blue Ocean® screen on the exterior wall of a two-car garage. We would have preferred a larger size in the 100 -150" range however we were restricted by having to fit the screen between a door and stairway. Blue Ocean® is rigid, insulates, and durably weather resistant so there is really nothing better suited for outdoor theater. Even if it starts blowing a northeaster with rain and snow, your client need not worry about the screen; remember this is the same material that Shamu has on his bay window. Our deck is equipped with a projector suitably powered for viewing from early evening. If you plan to make viewing earlier in the afternoon you should avoid designing into westward facing walls or you will need to specify a projector with very high lumen output. *(At least 3 lumen output per square inch of screen)*



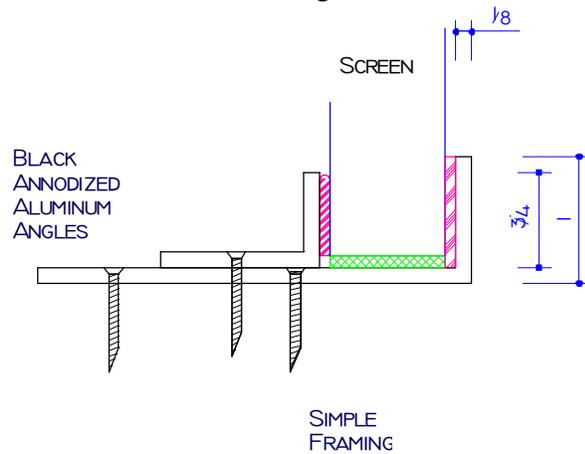
We mounted the projector on the garage ceiling in front of the garage door opener. Most projectors come with a standard lens that has telescopic/zoom functions and optical lens shift. This allows the projector to shoot down to the screen from a higher position and still maintain correct optics. In this case, our total throw distance was not an issue as we had more than enough space on the garage ceiling. We selected the new 1080 resolution Panasonic AE1000U with its standard lens. When planning a garage based layout, keep in mind the relative position of the parked cars to your projection path. Make sure that your projector's lens shift allows for a clear obstruction-less projection path. In our case, we shoot with lots of room to spare over a tall family van. If you are shooting in parallel with the parked cars your task will be somewhat simpler. Remember too that you can design with a short throw lens for those outdoor applications where an adjacent garage space is not available.



Our company sells a variety modular screen frame systems for exterior mounting applications that include integral speaker systems and exterior shutter/door systems. However for our demo we chose to create a custom prototype from materials readily available to any builder. We created a rough opening and structural header exactly as if we were installing a window. Our 72" diagonal screen is 63" x 35" and we add 1" to arrive at rough construction opening of 64" x 36". We framed the exterior opening with black 1/8" anodized aluminum angles and flat aluminum stock, and sealed all the junctures with black GE Silicon II Window & Door Sealant. For the sill, we cut a 1/4" slope on the



horizontal stud for wind driven rain runoff, and the aluminum base plate easily conformed to the slope once we fastened the setting screws.



We devised a rotating door with integral core aluminum framing which contains the center, right, left, and subwoofer speakers. The exterior of the door is clad in the same exterior cedar siding so when shut the entire outdoor theater disappears. We went to extra detail in creating full rotation and an upward motion that actually lift the door's inner corner up and out of the aperture while still keeping the entire hinge detail hidden when the door is shut. With just a little pull and push, the same as opening a car hatchback, the air pistons push the door up to a 178° angle with the speaker system now facing down toward the deck audience and the screen surface is totally exposed.



It is truly apparent that incorporating Blue Ocean® technology into residential entertainment design brings many possibilities and benefits while also adding value to the home.