

# News to Use

# Design Requirements Manual

The formulae  $\frac{\partial U_i}{\partial x_i} + \frac{\partial (pU_i)}{\partial x_i} = \frac{\partial p}{\partial x_i} \left( \mu \frac{\partial U_i}{\partial x_i} + z_i(\rho - \rho_i) \right)$  for building  $\frac{\partial (pU_i)}{\partial x_i} = \frac{\partial p}{\partial x_i} \left( \mu \frac{\partial U_i}{\partial x_i} - \rho \mu \frac{\partial U_i}{\partial x_i} \right) + z_i(\rho - \rho_i)$  state of the art  $\frac{\partial (pU_i)}{\partial x_i} = \frac{\partial p}{\partial x_i} \left( z_i \frac{\partial U_i}{\partial x_i} - \rho \mu \frac{\partial U_i}{\partial x_i} \right)$  biomedical research facilities.

'Design Requirements Manual (DRM) News to Use' is a monthly ORF publication featuring salient technical information that should be applied to the design of NIH biomedical research laboratories and animal facilities. NIH Project Officers, A/E's and other consultants to the NIH, who develop intramural, extramural and American Recovery and Reinvestment Act (ARRA) projects will benefit from 'News to Use'.

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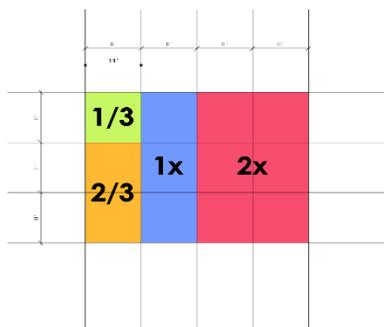
## Improving Design Using 3D Visualization

Excellence in design is a primary goal for all NIH design and construction projects. A commitment to quality by the design and management team is necessary to achieve this goal. Quality architectural and interior design can have a direct impact on improving the facility operating efficiency, attractiveness, life cycle economics, and ultimately, the productivity of the facility users.

Design excellence does not have to add to project costs, but does require a balanced approach to design which optimizes the functionality, aesthetics, quality and maintainability of facilities. One important tool for achieving design excellence is utilizing the power of 3D visualization during the design process.

With the progression of digital design, including advanced Computer Aided Design (CAD) and Building Information Modeling (BIM) there are greater opportunities to integrate 3D visualization into the design and construction process. 3D visualization is accessible via a host of software packages, and from the web and mobile handheld devices. As a design tool 3D visualization is now as common as a designer's sketchbook. It can be used for every day planning and design decisions and is no longer limited to grand presentations.

Figure 1: 2D diagram of lab module concept



### Design Development Communication

3D visualization can be used in many ways throughout the design process, including:

### Conveying Information

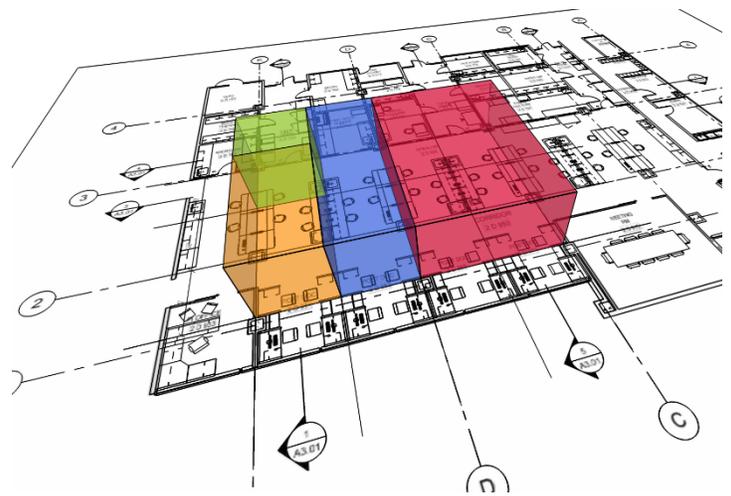
Scientists and other facility users are not trained in the reading and interpretation of 2D diagrams and plans. 3D

images are easier for them to conceptualize and understand, and when an unbuilt space is understood more clearly the resulting discussion, comments and approvals are more meaningful.

**Relationships** 3D visualization is a useful tool for both facility users and design professionals to explore spatial adjacencies and relationships which may not be as readily apparent in 2D drawings. This is especially important with complex facilities with integrated systems and components.

**Volumetric Understanding** Building components, spaces, equipment and other volumetric elements are more easily understood in the vertical axis, which is not easily conveyed in 2D diagrams and plans.

Figure 2: 3D visualization of lab module concept



### Level of Detail for 3D models

The 3D Model can be presented in an array of design levels and technical exactness. Simple volumetric line drawings convey geometry and scale. Greater resolution can show additional levels of detail up to photo-realistic representation. The highest level of detail is not always productive or useful and the appropriate level of representation should be used:

**Basic:** Simple massing models communicate the general organization and configuration of a space or process.

**Intermediate:** Images with a level of detail that may include hardware, equipment, furniture, people (for scale) and other items that convey the use and function of a space.

**Advanced:** Rendered images or walkthroughs with possible real world likenesses, colors, dimensions or shadow illustrate how a space will actual look.

### Summary

The capabilities of advanced CAD, BIM and other programs should be used to develop 3D visualization tools which can increase understanding and promote dialogue with the goal of improving the level of design.

Further details on this month's topic are available on the DRM website:

[Design Requirements Manual](#)

DRM Chapter 4, Section 1