

Proposing Optimized Layout to Cut Drywall Panels Using Building Information Modeling

Bardia Jahangiri, MSCM and Julian Kang, Ph.D.

Texas A&M University
College Station, Texas

Construction industry generates a substantial portion of solid waste. A part of waste generated in new construction is the result of cutting the building materials including drywall panels into pieces. This type of waste is also known as leftover or residual and includes leftover material scraps from cutting stock-length material into shorter or smaller pieces to fit the design. Drywall is one of the major components of waste in new construction. Currently, the builders neither do a detailed analysis of how much sheetrock would be required nor use any consistent system for reusing their scrap and often cut a needed length of sheetrock from a brand new sheet instead of using available scrap. Building Information Modeling as an object-oriented model of the building contains all the required data and can be utilized to provide drywall crews with layouts showing how to cut the panels into required pieces so the leftover will be reduced. The single most effective way of dealing with any solid waste is not to create it in the first place. Optimization methods are currently being utilized in other industries to solve the problem of cutting raw material into required pieces. In addition, Building Information Modeling (BIM) enables us to get access to extensive amount of information about the building and its components. Therefore, there exists an opportunity to reduce construction waste through proposing an optimized layout to cut drywall panels using BIM. This study investigates if it is feasible to reduce the waste of drywall by customizing the optimization methods being used in other industries. Optimization methods being used in other industries will be studied. These methods need to be customized so that they can be applied on drywall panels using the information extracted out of a Building Information Model. One of the problems that need to be addressed through customization of these methods is the process of hanging drywall panels. This process consists of two different steps. First, whole panels are hung to cover the maximum possible area and then in order to cover the remained surfaces, stock drywall panels are cut into pieces with required dimensions. Therefore, the layout and location of those pieces depend on how the whole panels are previously hung. There are other factors that need to be considered including taping process and framing layout, which drives the allowable dimension of drywall pieces. In order to test that the customized optimization method produces acceptable results, it should be applied on a set of simple geometries. The proposed optimization method will then be tested using the actual projects that StyleCraft Builders, Inc. is working on in order to see if the proposed method can actually reduce the waste in drywall panels. For this test, the amount of waste to be produced by the proposed method will be measured and analyzed.

Key Words: Optimization, Building Information Modeling, Drywall, Leftover