# PAC ENGINEERING EVALUATION AND DATA SHARE PROGRAM

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The fire testing industry has had enough experience with testing materials assembled into complete constructions, that sets of rules have been developed, which can help in determining a worst case scenario for testing. Then, utilizing the recognized set of rules, the materials employed in the worst case test can be used to recognize (in the form of an Engineering Evaluation, which we abbreviate as EEV) other assemblies in which equal or less severe materials are incorporated.

Engineering Evaluations (also called Engineering Judgements) can be done for practically any assembly of materials, and in consideration of a wide range of test methods. A partial list of appropriate test methods includes:

| TEST METHOD | PROPERTY EVALUATED |
|---|---|
| ASTM E119 / UL 263 | Fire resistance of construction assemblies |
| UL 10 (A, B & C) | Fire resistance of door assemblies |
| NFPA 285 | Surface flammability of façade assemblies |
| NFPA 286 | Surface flammability of room interior linings |

Basically, any assembly of materials constructed in a specific manner may be appropriately evaluated in accordance with a specific test method and the results of smaller-scale tests and sound logic used to predict how other materials can be exchanged for ones in the original test assembly without negatively affecting the desired performance. This is commonly used to expand the range of construction details and also to make judgements on assemblies that are mistakenly constructed differently than originally approved.

As an example, assume an E119 test wall was constructed using 2x4 loadbearing wood studs, spaced 24" OC, insulated with polyurethane insulation and clad on both sides with ½" type X drywall. In this case, a single successful test could be used to qualify either wood or steel studs; polyurethane, fiberglass or mineral wool insulation; and, ½" or ⅝" thick type X gypsum drywall. Without these recognized rules (formally, ASTM E2032-09(2013) Standard Guide for Extension of Data From Fire Resistance Tests Conducted in Accordance with ASTM E 119), instead of a single test, 12 tests (2 possible studs x 3 possible insulation types x 2 gypsum thicknesses) would be required to cover all possibilities. And this can be expanded to include stud depths, sizes, gauges, other insulations types, combinations of different gypsum wallboard thicknesses on each side of the wall. It is easy to see that the number of combinations grows extremely rapidly!

The example above illustrates the importance of correctly designing a test specimen construction which will yield the maximum amount of recognition in the construction industry. These tests cost thousands of dollars to perform, and, unless approval is required for a specific, single construction, some good planning ahead of a test will pay off handsomely.

How does one make decisions concerning which of assembly of various materials is "worst case?" That depends on details such as the fire properties for which they are being evaluated, their precise location and function within the assembly, their previous performances in the test method being considered, etc. Typically, a baseline test (or set of tests) is performed in accordance with the test method for which a broad range of approvals is desired, using a carefully chosen set of materials and configurations. Then, using established rules, past experience, and various smaller (hence, less expensive) test methods, other materials can be considered for use in specific locations. Smaller scale tests such as ASTM E84 Surface Burning Characteristics of Building Materials, ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C (used to determine noncombustibility) and ASTM E1354 Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter are frequently used. They all determine different combustion properties and each is valuable in ranking the relative performance of materials in specific locations. Since the E1354 Cone Calorimeter test yields the widest range of combustion property information for a material, it has been widely used to rank the flammability performance of different materials in a fire scenario.

Now, let's consider the NFPA 285 Standard Test Method for the Evaluation of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components. A typical wall assembly requiring evaluation by this method contains many individual parts, as listed below.

**STUDS:** Studs are normally made of steel, but the gauge, depth and spacing varies between assemblies.
**INTERIOR CLADDING:** This is normally ⅝" type X gypsum wallboard, but is sometimes varied to meet other code required properties.
**CAVITY INSULATION:** The cavity insulation can range from spray foam to mineral wool and any of the common insulations currently in use.
**EXTERIOR CLADDING:** This is normally specified to have good moisture resistance, such as exterior gypsum cladding, but thicknesses may vary and other material are often utilized.
**WATER RESISTIVE BARRIER (WRB):** These barriers can consist of thin sheet, spray- or trowel-applied, board stock or other systems.
**EXTERIOR CONTINUOUS INSULATION:** These can be SPF, EPS, XPS, Polyiso board stock or other systems.
**EXTERIOR CLADDING:** These may consist of metal clad panels, brick, veneers and a wide range of other systems.

So, as the above shows, any exterior façade construction assembly can consist of a wide range of materials, systems and assemblies (and thus a huge number of possible combinations); hence the NFPA 285 is well suited for testing worst case conditions and developing engineering judgements or evaluations which recognize the applicability of a large number of other possibilities. Not all evaluations can be covered by a single test, and many manufacturers have run multiple tests to fill out their tables of recognized components.

Now, we come to the PAC Data Share Program. Obviously, it is to the advantage of a manufacturer of a specific component (say, exterior insulation) to include as many other manufacturers of (non-competing) components in their table of approved systems as possible (e.g., WRB, exterior claddings, etc.). Having no interest in manufacturing WRBs (for instance), but wanting to include as many possible examples in their table of approved components (to widen the use of their system in the field), the exterior insulation manufacturer will perform an NFPA 285 test using a WRB of specific flammability, and request an engineering evaluation of other WRBs for inclusion in his table of approved components. To do that, PAC will request appropriate full- or small-scale test data from a wide range of WRB manufacturers (and their permission to utilize that data in specific evaluations), and will make an engineering evaluation of which are appropriate for use with the insulation manufacturer's system. The test data is submitted confidentially to PAC by manufacturers, and used to compare to previously tested products. This is a win-win for both the insulation and WRB manufacturers, since it leads to wider recognition of both products. At the same time, a manufacturer of a specific WRB may wish to enter into a Data Share program with makers of insulation and other products, so that an engineering evaluation on his system can contain as many other products as possible.

Another example illustrates a situation that is very active at this time. Many holders of Engineering Evaluations for their WRB and exterior insulation systems do not have SPF in the stud cavities as an allowed choice for the stud cavity insulation. We have enough clients and references to add many SPF insulation products in the stud cavities for clients who tested a different cavity insulation, but desire SPF be added to their EEV.

To write an EEV, we typically start with a tested assembly and make a list of the materials used. We then make a list of conservative alternate materials which we know will improve results. This typically includes use of thicker stud gauges, shorter stud spacing, thicker sheathings, thinner insulations (and/or less dense), replacement of insulations with noncombustible products and alternate WRB/AVB materials based on relative flammability data using cone calorimeter tests. Exterior cladding choices can be evaluated via reduced air gaps and improved thermal performance.

Priest & Associates has worked with an extensive list of clients who are willing to share NFPA 285 or cone calorimeter reports to extend the range of choices we have for new clients. Some of our clients manufacture exterior insulations, cavity insulations, WRB/AVB products, and claddings. It is in our clients' best interest to allow use of their reports for EEV's of new clients to extend the number of evaluations which reference their tested products.

The Data Share program starts with PAC asking an existing client for permission to use their data or reports for use in the analysis for a new client's EEV. The data or report is not shared with the new client, nor is the data revealed. The data is kept confidential in PAC files and is only used for reference and analysis for the new EEV.

If you hold a successful NFPA 285 report, and are seeking to expand the list of alternate products which could be utilized, contact us to find out how we can help. We can also write job-specific Engineering Letters (short EEV's) for specific building projects if you do not need a full EEV. In all cases, we need an existing NFPA 285 report in order to successfully achieve your goals. If you do not hold an NFPA 285 report, we can help you design an NFPA 285 test which has a good chance of passing and has the most potential for granting engineering extensions to allow use of alternate products or materials.