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ATTACHMENT#2
WATER DAMAGE CLAIM DATABASE MANUAL

PIER FINAL PROJECT REPORT

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Water Damage Claim Database Manual

Main Manual

Task 2
Situation Analysis

Final Report
on
Subtask 2.2 Insurance Industry Database
and
Subtask 2.5 Synthesized Mold Incidence Database

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Task 2 – Subtask 2.2 and 2.5 Final Report
Water Damage Claim Database Manual

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Executive Summary

One of the goals of Task 2.0 Situation Analysis was to produce and evaluate a baseline demographic data set of mold incidences in single family California homes. That goal was to be supported by a three step process with the following three subtasks performed in sequence: Subtask 2.2 Insurance Industry Database; Subtask 2.3 Industry Interviews; and Subtask 2.5 Synthesized Mold Incidence Database. Subtask 2.2 was to establish the quantitative relational database linking concurrent statewide water damage (NOT mold damage) claims, weather conditions, and residential construction statistics. Subtask 2.5 was to combine this quantitative database information from Subtask 2.2 with qualitative insurance, building, and remediation industry survey information (including input on mold damage claim activity) from Subtask 2.3 to generate a synthesized database of mold incidences in California.

The California Department of Insurance (CDI) provided the water damage claim data for years 2000 through 2002 that was collected under Special Data Call EF-2002 and its Addendum on Earthquake and Fire Experience. Note that no claim data specific to mold damage was collected by CDI. On average during that 3 year period, 27.2 water damage claims per 1000 policies were experienced annually statewide. In descending order, the following 5 of California's 16 climate zones -- 10, 7, 15, 14, and 6 -- experienced above average water damage claim activity. On a county basis in descending order, the following 8 of California's 58 counties -- Riverside, Orange, San Diego, San Bernardino, Contra Costa, Ventura, Solano, and Kern -- experienced above average water damage claim activity.

After a review of the other relational database needs and source options, the following federal/state agencies were contacted and their on-line data libraries were accessed for relevant concurrent weather conditions: National Climatic Data Center (NCDC); and construction statistics: U.S. Census Bureau (USCB) and California Department of Finance (CDF). Relational databases associating water damage claim activity with key concurrent weather conditions – ambient dew point temperature and precipitation – were developed from a county level basis down to a zip code level basis. Additionally, a relational database associating water damage claim activity with key construction statistics – number of single family building permits, number of single family homes, and age of homes – was developed at a county level.

In order for mold to grow, the relative humidity (RH) of the surrounding air must be fairly high, generally at or above 70%. At a 75 ^{o}F dry bulb temperature indoors, 70% RH is equivalent to about a 65 ^{o}F dew point. In warmer weather climates, sustained ambient dew point temperatures above this value create the potential for infiltrating humid outside air to generate 70%RH, and to even condense on cooled surfaces, in the envelope and interior of air conditioned buildings. Previous experience (see Manual G) with a Texas Department of Insurance (TDI) mold damage claim database had statistically demonstrated a correlation between ambient dew point temperature and mold damage claim activity. Locations (municipalities) with sustained (average monthly) ambient dew point temperatures at 70 ^{o}F or higher along the Texas Gulf Coast showed mold damage claim activity dramatically higher than drier central and western regions of Texas with dew point temperatures below 65 ^{o}F. Weather data sites throughout California rarely see any sustained dew point temperatures above 60 ^{o}F and

hence no statistical correlation was found between California water damage claim activity and ambient dew point temperatures. This finding would support the position that condensation plane formation in walls, etc. is not a likely scenario for water intrusion into building assemblies in California homes.

The other major weather driven mode for water intrusion is precipitation, especially wind driven rain. Again previous experience with the TDI database did show a correlation, albeit weaker, between increased levels of rainfall and elevated levels of mold damage claims. Some preliminary county level based correlations in California, using the given county's most populous city as the weather data site, did show trends of increasing water damage claims with increasing rainfall totals. However, a more localized analysis of California weather data site rainfall and wind driven rainfall amounts versus immediately surrounding zip code areas and their water damage claim activity revealed a scatter plot with no correlation evident. This finding with the California water damage claim activity was not consistent with the mold damage claim activity correlation with rain data in Texas. However, this lack of any consistent correlation in these California relational databases between rainfall and water damage at a "macro" (county, municipality, or zip code) housing stock level, does not preclude rain or wind driven rain from being a mode for water intrusion and damage at a "micro" (individual or single family) home level. The current correlations cannot account for other moisture sources impacting on envelopes either, such as: rain soaked building assemblies that are enclosed during construction before drying; or irrigation (sprinkler) systems that overspray onto foundations, slabs, and walls on an ongoing basis.

Construction data did exhibit stronger correlations with water damage claim activity. Counties that issued larger numbers of single family home permits (higher residential construction activity) generally showed higher levels of water damage claims per 1000 policies. Although not as strong a correlation, counties with newer single family home inventories on average generally showed higher levels of water damage claims per 1000 policies, as well. Finally, counties with larger inventories of single family homes generally showed higher levels of water damage claims per 1000 policies. Other construction data related to building construction characteristics such as primary/secondary exterior wall material, foundation type, etc. were not available from the USCB or CDF below the West Census Region level, and hence could not be applied to relational databases for California only.

Interviews in Subtask 2.3 with insurance companies, claims adjustors, builders, and mold remediators resulted in estimates of mold damage claims constituting on the order of 40% of the water damage claims. The Project Advisory Committee (PAC) and California Energy Commission staff determined though that a synthesized variant of the water damage claim database would add limited value, since water damage was seen as the precursor to potential mold damage anyways. The insurance industry has only begun coding mold damage claims separately from water damage claims since about the year 2000. Until then mold damage claims were included under the same code as water damage. In lieu of synthesizing an additional mold damage claim database, the California Energy Commission staff and PAC recommended additional relational weather and construction database development and evaluation (including the detailed precipitation and housing permit, inventory, and age analyses noted above) along with a consolidation of the Subtask 2.2 and 2.5 reporting, as done here in this document.

Background

Overview

Modern building envelopes do not "breathe" like their counterparts of the past. When water intrudes into envelope cavities in a sustained manner or does not dry quickly, mold may propagate due to “trapped” moisture. Also, present day construction increasingly involves the use of wood with high moisture content for framing. Once the wall cavity is sealed, the retained moisture contributes to favorable conditions for mold growth. Damp insulation and resulting mold growth compromise building envelope energy efficiency, damage building materials, and affect the health and productivity of occupants. Once mold growth occurs, it is costly to remove and often results in expensive litigation. By understanding the demographics of mold incidences and building construction parameters affecting mold growth, it may be possible to mitigate or eliminate mold growth, thereby limiting heating and cooling energy losses, reducing building remediation costs, and avoiding human exposures.

There is a great need to understand the susceptibility of various construction practices and building assemblies to mold growth in the different California climate zones. For instance, a wall assembly consisting of cellulose insulation with high moisture content wood framing and paper-backed drywall with vinyl wallpaper is known to be highly susceptible to rapid mold growth under high moisture conditions. On the other hand, foamed insulation with proper water drainage channels to outdoors and properly dried wood framing along with fiberglass-backed drywall coated with paint containing a fungicide may be less susceptible to mold growth in the presence of moisture. In the mold-susceptible assembly, it will likely be necessary to replace the entire wall assembly, whereas the mold-resistant assembly may be salvageable under the same conditions. By improving the understanding of the geographic distribution of mold incidences and the mold susceptibility of these assemblies, and by communicating this understanding to builders and energy codes and standards organizations, improved decisions can be made regarding options for retention of envelope energy efficiency, integrity, avoidance and mitigation of water intrusion, and mold loss prevention.

Scientific advancements proposed in this project will not be adequately addressed with developmental capabilities within the competitive or regulated markets. Builders and building contractors are typically small businesses without resources to conduct a research effort of this magnitude and scope. The insurance industry has opted to deny mold coverage rather than incur large exploratory research expenses. Benefits of the proposed research will primarily accrue to the California electric ratepayers through reduced remediation costs and reduced insurance rates, as well as improved indoor environments. The expected research results will also influence California building energy codes and standards. California Energy Commission Public Interest Energy Research (PIER) funding is a key mechanism for funding such dispersed benefits projects. The Gas Technology Institute (GTI) is the prime contractor for this research program with the University of Illinois and its Energy Resources Center (UIC-ERC) as a key project subcontractor.

Objective

The primary objective of the UIC-ERC subcontracted effort supporting this overall GTI program is to provide a relational database linking mold incidences, climatic conditions,

and construction data in California. The task objective of Task 2.0 Situation Analysis is to perform a situation analysis of mold incidences in California homes. This situation analysis includes the following subtasks:

Task 2	Situation Analysis
Subtask 2.1	Literature Review
Subtask 2.2	Insurance Industry Database
Subtask 2.3	Interviews and Surveys
Subtask 2.4	Candidate Building Assemblies and Practices
Subtask 2.5	Synthesized Mold Incidence Database

The subtask objective of Subtask 2.1 is to establish the initial relational database linking water damage incidents, weather conditions, and building construction data. Individual subtask objectives are:

- Obtain water damage claim data from an existing California Department of Insurance (CDI) database for experience years 2000 through 2002 identifying total number of policies, number of water damage claims, and cost of water damage claims, by county and zip code,
- Supplement this insurance industry data set with relevant weather conditions and available building construction statistics for the same time period as the water damage claim data for each of the California counties.
- Aggregate these data sets by county, zip code, and California climate zone, into a Water Damage Claims Database, and identify preliminary statistical trends in the database. This initial database will be used for further analysis, as directed by the GTI project team, the California Energy Commission staff, and Project Advisory Committee (PAC), under Subtask 2.5 Synthesized Mold Incidence Database.

As noted previously, the Project Advisory Committee (PAC) and California Energy Commission staff determined that a synthesized variant of the water damage claim database would add limited value, since water damage was seen as the precursor to potential mold damage anyways. So in lieu of synthesizing an additional mold damage claim database, the California Energy Commission staff and PAC recommended additional relational weather and construction database development and evaluation (including the detailed precipitation and housing permit, inventory, and age analyses), along with a consolidation of the Subtask 2.2 and 2.5 reporting, as done here in this document.

Process

To accomplish this objective, a data collection, reduction, and aggregation process described here, and in the separate manuals, was implemented. The process began with data source identification. As noted before, the California Department of Insurance (CDI) was identified as the source for the water damage claim data. After a review of the other data needs and source options, the following sources were targeted for relevant weather conditions:

- National Climatic Data Center;

and construction statistics:

- U.S. Census Bureau;
- California Department of Finance; and
- Counting California.

The next section delineates the organization of all the supporting manuals and spreadsheets that provide a detailed discussion of:

- ❑ the data collection and reduction process from those five data sources;
- ❑ the aggregation of those individual data sets into three relational versions of the Water Damage Claims Database; and
- ❑ the statistical trends in the database related to weather and construction data.

Database and Spreadsheet Organization

The supporting manuals are organized as shown in the following table.

Manual	Topic --	Spreadsheet
	Data Sources	
A	Water Damage Claims	NA
B	Weather Conditions	NA
C	Construction Statistics	NA
	Relational Databases	
D	Climate Zone Based	D
E	County Based	E
F	Zip Code Based	F
	Statistical Trends	
G	Water Damage Claims and Weather Data	G
H	Water Damage Claims and Construction Data	H