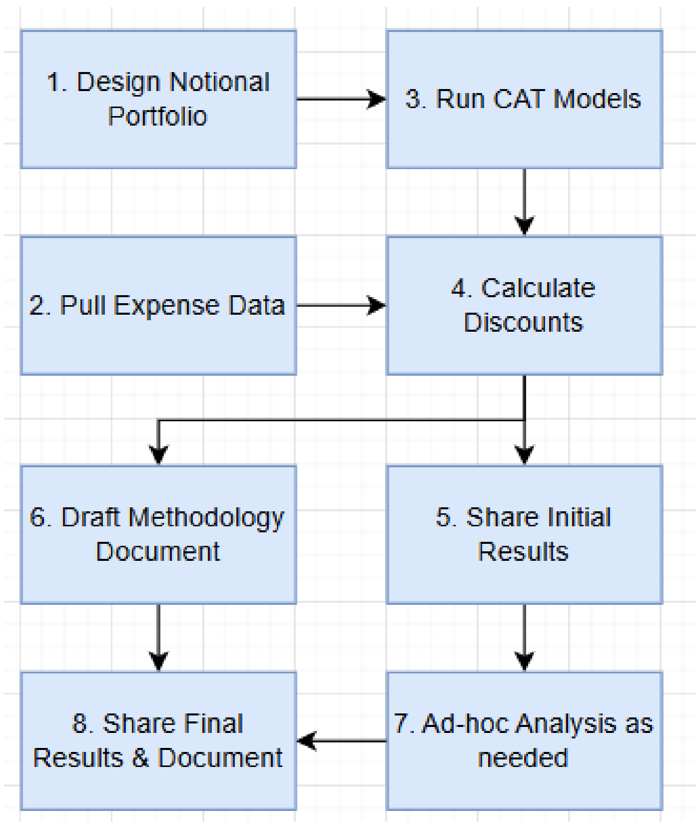
NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS

Development of Catastrophe Mitigation Discount Table
Minnesota FORTIFIED – Methodology Document

March 2026

General Methodology Overview

This overview and flowchart provide high-level context on the typical process for NAIC Catastrophe Risk Management Center of Excellence (CAT COE) support in developing mitigation discount tables. The CAT COE team coordinates closely with the Department of Insurance (DOI) throughout this process.



Mitigation Discount Table Development Background

Minnesota's mitigation discount work was performed to support implementation of Minnesota Statutes § 65A.298, *Homeowner's Insurance; Fortified Program Standards*, which requires insurers to provide a premium discount or rate reduction for residential "insurable property" certified by the Insurance Institute for Business & Home Safety (IBHS) as meeting the FORTIFIED program standards (including a hail supplement), for both new properties and retrofitted existing properties. The statute further requires insurers to file actuarially justified rates and a rating plan with the Commissioner of Commerce and directs the Commissioner to evaluate evidence of cost savings attributable to the FORTIFIED standards and whether those savings are passed through in full to qualified policyholders.

Accordingly, the methodology described in this document develops mitigation discount factors intended to quantify the expected reduction in wind and hail losses associated with IBHS FORTIFIED certifications and to provide a consistent, transparent basis for insurer filings and regulatory review in Minnesota. The analysis utilizes detailed catastrophe model output from industry vendor simulations to quantify how structural resilience affects modeled losses. Model results were filtered to a consistent set of base structure characteristics, aggregated by fortification level, and converted into normalized loss cost metrics that represent the average annual loss per $1,000 of insured value statewide.

Design Notional Portfolio (Step #1)

To develop the mitigation discount factors, the gross loss costs for each IBHS fortification level (unmitigated/base, Roof, Silver, Gold) must be computed using a representative base structure configuration for residential exposures. The loss cost is defined as:

$$\text{Loss Cost} = (\Sigma \text{ Gross Loss} / \Sigma (\text{Coverage A} + \text{B} + \text{C} + \text{D})) \times 1000$$

This represents the statewide average annual gross loss per $1,000 of total insured value (TIV) for each fortification level, as well as for the base structure.

To isolate the effects of IBHS fortification, a consistent set of base structural parameters was applied to residential properties. These parameters are shown in the table below:

Attribute	Value	Notes
Coverage A (Primary Building)	$525,000	Median home value for MN
Coverage B (Auxiliary Structures)	$52,500	10% of Coverage A
Coverage C (Contents)	$262,500	50% of Coverage A
Coverage D (Additional Living Expense)	$105,000	20% of Coverage A
Year Built	1994	Typical home-built year
Construction	Wood Frame	Residential wood-frame construction
Occupancy	Permanent Dwelling – Single Family	Residential, Single Family
Stories	Default (Unknown)	Unknown number of building stories
Roof Year Built	2000	Represents a 15+ year-old roof (Old Age)
Roof Cover	Asphalt Shingles	Standard residential roof type
Roof Deck	Default (Unknown)	Unknown residential roof deck
Deductible Value A	$5,250 or 1%	Represents 1% deductible level for Coverage A

The above characteristics were used to place an identical home at each zip code centroid in the state. A similar home was then created with identical characteristics for each location, except with the home built to IBHS FORTIFIED Roof with Hail Supplement standards[1]. The same process was done for IBHS FORTIFIED Silver and Gold (both with Hail Supplement)[2][3].

For the Verisk model, the IBHS levels were modeled using the Certified Structures (IBHS) modifier, which has values specifically for IBHS FORTIFIED Roof, Silver, and Gold. These values were combined with the Roof Hail Impact Resistance modifier to apply the Hail supplement designation as well. For the KCC model, the IBHS levels were modeled using the IBHS Fortified Code modifier, which has levels specifically for Roof + Hail, Silver + Hail, and Gold + Hail. These settings ensure that the IBHS designated homes are appropriately represented in the models.

Run CAT Models (Step #3)

This analysis used two industry-standard Severe Convective Storm (SCS) CAT models: Verisk and Karen Clark & Company (KCC). SCS models consists of tornado, straight-line wind, and hail events. The KCC model used was the SevereConvectiveStorm_NAM-US_v4.0 on the RiskInsight 4.15 platform. The Verisk model used was the Severe Thunderstorm model, Touchstone v13 (2025), using the10K US AP (2025) – US ST Expanded Events event set. Demand surge was included in both model runs.

For this mitigation discount table development, Verisk and KCC performed the catastrophe model runs sharing the model output results with the NAIC CAT COE team for their further mitigation discount table estimation. The resulting model output contains detailed location-level results for residential exposures, including gross losses, replacement cost coverage values (Coverage A–D), and structural attributes (e.g., year built, construction type, roof cover, IBHS level, etc.).

The following post-model processing was done to develop the final loss costs:

1. Load and Standardize Data – The model output CSV was read into a Python Pandas data frame and zip codes were standardized to five digits.
2. Compute Total Replacement Value – Calculated as (CovA + CovB + CovC + CovD).
3. Aggregate by IBHS level (unmitigated/base, Roof, Silver, Gold) – Summed Gross Loss and Total Replacement Value by IBHS level.
4. Calculate Gross Loss Cost – Derived as (Σ Gross Loss / Σ Total Replacement Value) × 1000.
5. Output Results – Saved summarized results to Excel.

The resulting Excel file included the following columns:

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[1] https://fortifiedhome.org/roof/
[2] https://fortifiedhome.org/silver/
[3] https://fortifiedhome.org/gold/

Column	Description
IBHS_Level	Unmitigated Base Structure = 0, IBHS FORTIFIED Roof = 1, IBHS FORTIFIED Silver = 2, IBHS FORTIFIED Gold = 3
GrossLoss_Sum	Aggregate modeled gross loss for each IBHS_Level
Coverage_Sum	Aggregate replacement value (CovA+B+C+D) for each IBHS_Level
LossCost	Computed loss cost ($ per $1,000 insured) for each IBHS_Level

Pull Expense Data & Calculate Discounts (Steps #2 and #4)

This section describes the actuarial steps used to translate the final catastrophe model loss costs into mitigation discount factors suitable for filing in Minnesota. Consistent with Minn. Stat. § 65A.298, the analysis focuses on wind and hail and is intended to produce discounts that are actuarially supported and reasonably aligned with expected loss cost savings from IBHS FORTIFIED designations.

The following key assumptions were used:

- The catastrophe modelers produced loss costs for a reference set of structures intended to represent typical Minnesota exposures, with "no mitigation" as the starting point.
- One modeler produced ZIP-level results and grouped ZIP codes into regions based on loss-cost similarity. Because mitigation relativities showed limited variation across the state, indicated credits were developed on a statewide basis.

Prior to performing the actuarial analysis on the final model loss costs, applicable standards of practice were considered. Two standards that commonly apply are ASOP No. 12 (Risk Classification)[4] and ASOP No. 38 (Catastrophe Modeling)[5].

- ASOP 12 is relevant when a risk classification system is designed, reviewed, or changed. In this work, the risk characteristic is the IBHS mitigation level, and the expected outcome is that higher mitigation levels should produce lower loss costs. Model results were reviewed to confirm that loss costs generally decreased as mitigation level increased, which supports the reasonableness of the classification pattern.
- ASOP 38 is relevant when catastrophe models are selected, used, reviewed, or evaluated. For this work, catastrophe model output is used for a purpose that is consistent with common industry practice: developing loss-cost relativities for mitigation features and converting them into indicated premium credits. Reliance is

[4] https://www.actuarialstandardsboard.org/asops/risk-classification-practice-areas/
[5] https://www.actuarialstandardsboard.org/asops/actuarial-standard-of-practice-no-38-revised-edition/

placed on catastrophe modeling experts for model operation and primary validation. In addition, reasonableness checks were performed on key outputs (for example, loss costs should decline as mitigation increases, and metal roofs should produce lower loss costs than shingle roofs, all else equal).

After considering ASOP 12 and ASOP 38, the development of the indicated mitigation credits follows the steps below.

1. **Assemble loss costs by mitigation level (by modeler)**
   For each participating modeler, extract (or infer*) loss costs for the base structure and each mitigation level.

   Example structure (illustrative values only):

Zone	Base	Roof	Silver	Gold
Statewide	0.50	0.45	0.40	0.35

   **Note:* One modeler provided indicated relativities rather than loss costs; loss costs were inferred from those relativities and validated with the modeler. The base structure should align to the insurer's base rate definition in the rating plan (here, a structure with no mitigation, including no hail supplement).

2. **Develop fixed expense and reinsurance provisions**

   For this analysis, the Minnesota Department of Commerce issued a data call (issued in February of 2025) to collect fixed expense and reinsurance provisions from insurers writing in the state. The data collected from this data call was supplemented with publicly available additional MN rate filings from SERFF.

   From this data, a summary provision for fixed expense and reinsurance was first calculated using a straight average. Further analysis showed that a single carrier materially distorted the result, so an adjusted straight average excluding the outlier was selected. For sensitivity testing, a weighted average based on market share was also calculated and compared to the selected provision.

   The selected percentage provisions were converted to dollar provisions by applying them to the base loss cost, using an estimated wind/hail premium level derived from an assumed total expense ratio (35% for residential) for this conversion step.

3. **Convert loss costs to indicated premium credits**
   Using wind/hail loss costs consistent with the statute's focus, indicated credits are calculated as:

$$Indicated\ Credit = 1 - \frac{Premium_{mitigated}}{Premium_{unmitigated}}$$

Premium is expressed using the standard actuarial form:

$$Premium = \frac{Loss + Fixed\ Expense + Reinsurance\ Cost}{1 - Variable\ Expense}$$

Under the assumptions noted below, the variable expense term cancels when forming the premium ratio, and the credit can be computed using:

$$1 - \frac{(Loss_{mitigated} + Fixed\ Expense + Reinsurance\ Cost)}{(Loss_{unmitigated} + Fixed\ Expense + Reinsurance\ Cost)}$$

Key assumptions for the premium credit conversion:

- The reinsurance provision, expressed as a percent of premium, does not vary by mitigation level (i.e., it is based on the base structure loss cost).
- The reinsurance provision applies only to wind/hail for this development.
- The fixed expense provision, expressed as a percent, does not vary by mitigation level (i.e., it is based on the base structure loss cost).

These assumptions were informed by review of filings used in similar exercises and by industry reasonability discussions. For other perils, other states, or a materially changed market environment, the assumptions should be re-evaluated.

4. **Select final credits across models**

   Model-specific indicated credits were smoothed to produce a monotonic pattern (Gold as the maximum credit; lower mitigation levels receive equal or smaller credits) and rounded to the nearest whole percentage point.

Perform further Ad-hoc Analysis as needed (step #7)

To determine the sensitivity of the indicated credits to the base structure assumptions, additional scenarios were also analyzed. These additional scenarios included adjusting the base structure attributes to alternative selections as shown in the table below. Note that Coverage amounts were not adjusted – since CAT models leverage a damage ratio applied to the Coverage amounts which are normalized to a loss cost basis, there are no impacts from alternative assumptions here. In addition, occupancy was left unchanged, along with the unknown assumptions for roof deck and number of stories. This left four key variables to test: year built, construction, roof year built, and roof cover.

Attribute	Original Value	Alternative Value
Year Built	1994	2025 (new)
Construction	Wood Frame	Masonry
Roof Year Built	2000	2025 (new)
Roof Cover	Asphalt Shingles	Metal

The results of this scenario testing showed that the model results are most sensitive to alternate roof cover and year built assumptions. Given that asphalt shingles are the prevalent roof type, as well as pre-1994 homes making up the majority of the housing stock, the original base structure assumptions still hold as most representative of typical MN homes. However, insurers may find it appropriate to vary discounts by these attributes.

Final Results (step #8)

Based on the initial model results and scenario testing, a best estimate for the mitigation discounts were selected. The best estimate represents the actuarial single-point estimate of the indicated discount, reflecting our professional judgment of the most reasonable value given the modeled outputs, scenario testing, and underlying assumptions. It is not necessarily the midpoint of the modeled range; rather, it reflects the value most consistent with the weight of evidence from the analysis. While a range of reasonable indications may exist around this estimate due to model uncertainty, parameter sensitivity, and alternative assumptions, the best estimate reflects our view of the most appropriate central indication. It is not intended to imply that lower discounts are automatically inadequate or inappropriate; however, discounts below this best estimate may require additional actuarial support or justification. Discounts at or above the best estimate would generally be considered consistent with the modeled analysis and may not require further demonstration of actuarial support.

These results are shown in the table below:

Mitigation Level	**Selected Credit* (best estimate)**
Roof + Hail	35%
Silver + Hail	38%
Gold + Hail	40%

*All credits above are for residential and total SCS (i.e., would apply to the wind/hail combined premium)

The ultimate selection and use of these results is the purview of the MN Department of Commerce. Questions on this document can be addressed to: insurance.bulletin@state.mn.us