Mapping Flowchart for Existing Commercial Residential Vulnerability Matrices V2.1

The objective of this flowchart is to aid in the mapping of policies to existing vulnerability matrices (VM). The chart is divided into independent lettered parts that are used to generate a name for the corresponding vulnerability curve. Each lettered part must be performed individually to classify a label for that particular parameter which will be used to obtain the VC's entire unique name:

For Instance, Part A determines the exterior wall of the policy and assigns the corresponding label to that wall type. The label is then imputed into the vulnerability curve name for the parameter "exterior wall". So, say for instance the exterior wall is timber- the corresponding label is "tbr" then the Vulnerability Curve parameter slot for exterior wall becomes "tbr".

So:

VC_model_type_exteriorwall_region_subregion_strength_numofstorys_roofshape_roofcover_decking_R2W_S2S_underlayment_garagedoor_doorprotection_openingprotection_shape_daterun.

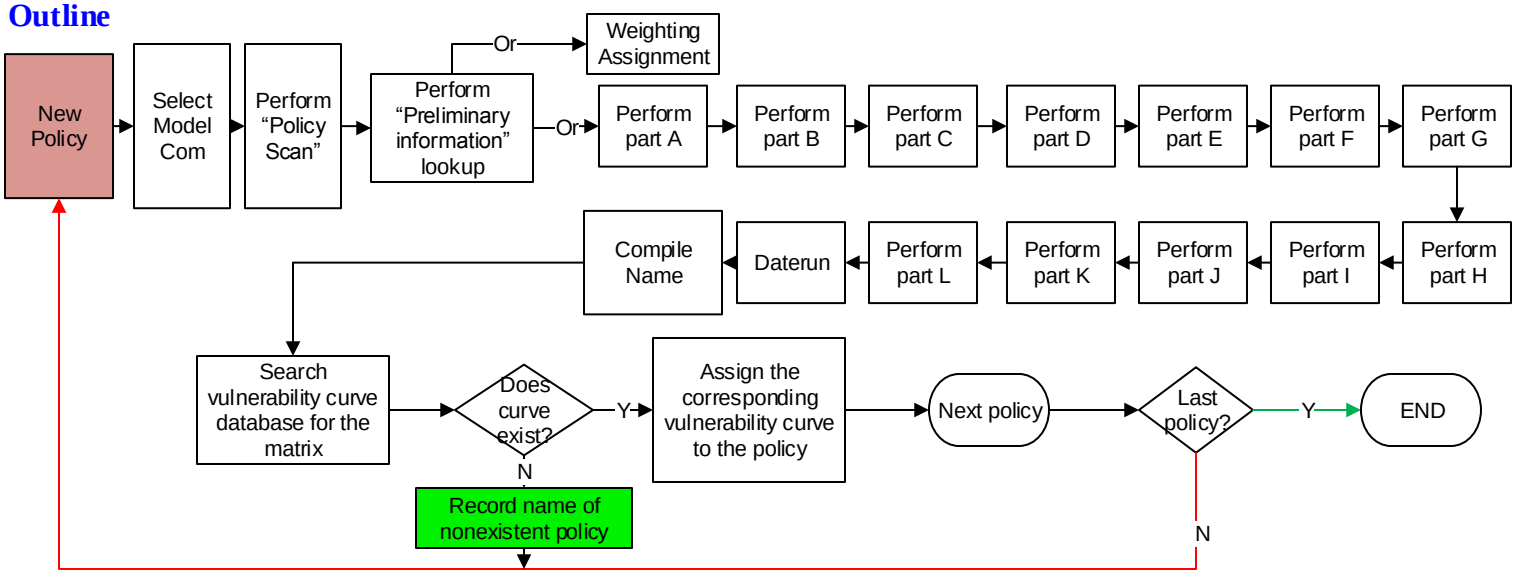
Becomes:

VC_model_type_Tbr_region_subregion_strength_numofstorys_roofshape_roofcover_decking_R2W_S2S_underlayment_garagedoor_doorprotection_openingprotection_shape_daterun.

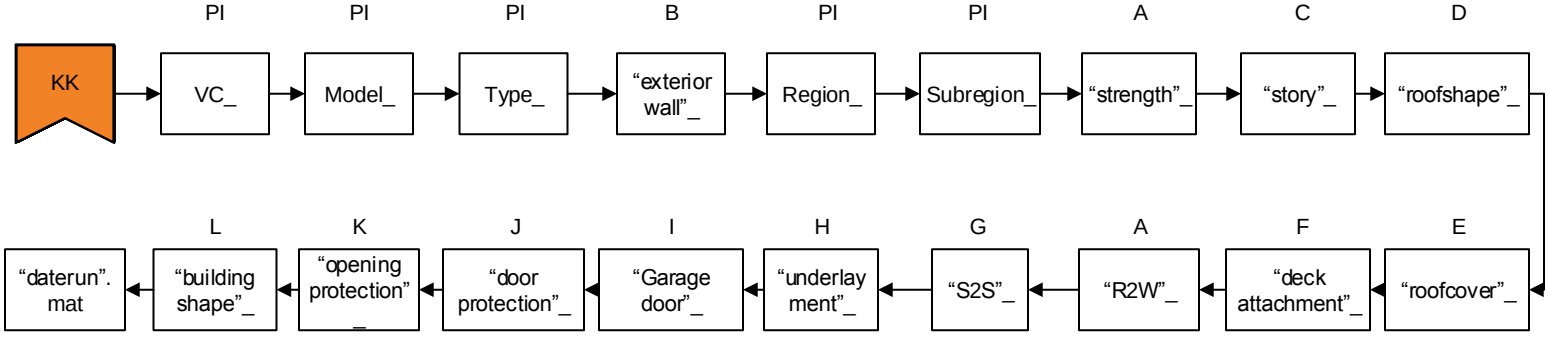
then one proceeds to the next parts to determine the rest of the parameters. Once all the parameters are either assigned or a weighting option has been defined then a name can be generated and compared to the existing library. Some lettered parts will determine labels for multiple parameters for instance the R2W connection check will be used to define a strength so both "strength" and "R2W" labels will be assigned (part B).

It is assumed that at a minimum, the policy will indicate the year built, the exterior wall and zip code information. From the zip code, parameters in the name such as region and subregion will be known.

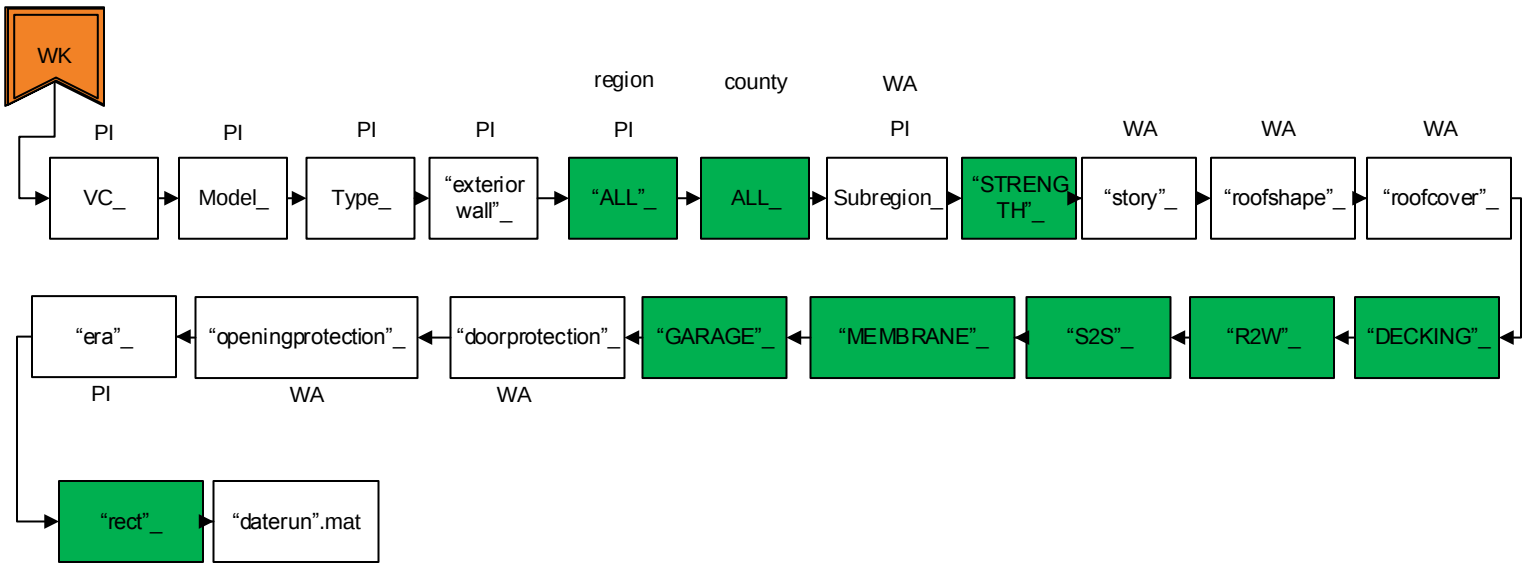
Outline



Vulnerability Curve name generator



Weighted Vulnerability matrix name generator CLR



Notes: blocks in green represent parameter names that remain unchanged.

Commercial Residential Model Information:

V1.2 CM For this Flow chart to work, additional documents need to be implemented. A companion file has all the Probabilities for commercial residential low rise buildings including the probable distribution of number of stories. A run date excel file will be provided along with the FTP file path. Additionally, not all portfolio's use the same name types so refer to engineering team for parameter equivalents.

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The CR process assigns weighted or age weighted matrices based on whether or not certain information is missing from a policy. If sufficient information is available for five key parameters (year built, exterior wall, roof shape, roof cover and opening protection) then the program runs through and assigns a vulnerability matrix or curve on a parameter by parameter basis. If a parameter is unknown, a random assignment is given based on statistics or a weighting option is defined.
In cases where no statistics are available, strength checks (SC) ,or in some cases, default values are implemented to determine the missing parameters

For Parts A-K always start at the Blue square and end at the orange off page reference marked (KK). Once a parameter has been determine, move on to the next part.

Some key points for the commercial model.
1) There are no region distinctions made for the commercial model. A value of "ALL" is used to define the "region" parameter.
2) There are not many county statistics so in the term for parameter "county", the term "ALL" is used.

Mapping Flowchart V1.2 CR
Updates from v1.1CR,
1) in PIC the way we deal with unknown year built and exterior wall has changed. Also the inclusion of an option to use decadal matrices has been included (for [RC, OP, RS] = [1 1 1])
2) Decadal matrices are an alternative to assigning a strength and going through the process required for the unweighted matrices.
3) naming conventions have been modified for regions and county parameters.(see above convention in red)
4) some naming conventions for weighted and unweighted matrices have been modified, (refer to WA, DVC, and parts A-K)
5) in WA for exterior wall = "other", the engineering team will NOT provide matrices for these cases. (an average of timber and masonry will be taken and the parameter will have to be saved as "other" for these cases.) this reduces the matrix library by 1/3.

Mapping Flowchart V1.3 CR
Updates from v1.2CR,
1) Vulnerability matrix was changed to vulnerability curves for all cases of the commercial low rise cases.(no matrices are generated only curves)
2)The Decadal matrix option was removed since they were not used.

Version 2.1 Updates

Modifications to V 1.3 for V2.1:

- In V 1.3, Certain portfolios had information available which made up illogical combinations i.e. strong models with un-braced gable ends or unreinforced masonry walls. The solution to this problem was to force certain parameters to be governed by their strength classification rather than what the portfolio policy claims that they are. i.e. a strength check is placed after the assignment of a certain parameter to ensure that a known parameter matches with the available logical strength configurations. E.g. for the exterior wall classification a previous check was used to determine if the masonry walls were reinforced. If the policy stated that they were reinforced but the rest of the model was weak then the name generated would not exist. The reinforced check was thus removed and a strength check was placed there instead as to force all weak models to be unreinforced and all strong and medium models to be reinforced.
- Lettered parts “A” and “B” were reordered since the strength assignment of the old Part B was needed for the old part A. hence, the new “Part A” is the R2W and strength assignment and Part B is the exterior wall assignment.
- External strength checks were removed and included in the actual lettered parts for Roof cover, Deck attachment, exterior walls etc.
- Certain parameter classifications were changed since currently the vulnerability matrix library does not include these parameters. Namely
    1) underlayment = “extra” is now set to underlayment = “reg”. but may be reinstated in the future once the engineering team models additional secondary water barriers.
    2) mitigated glass in part K was changed from “stlSht” to “plySht” since this was a typo in the previous version

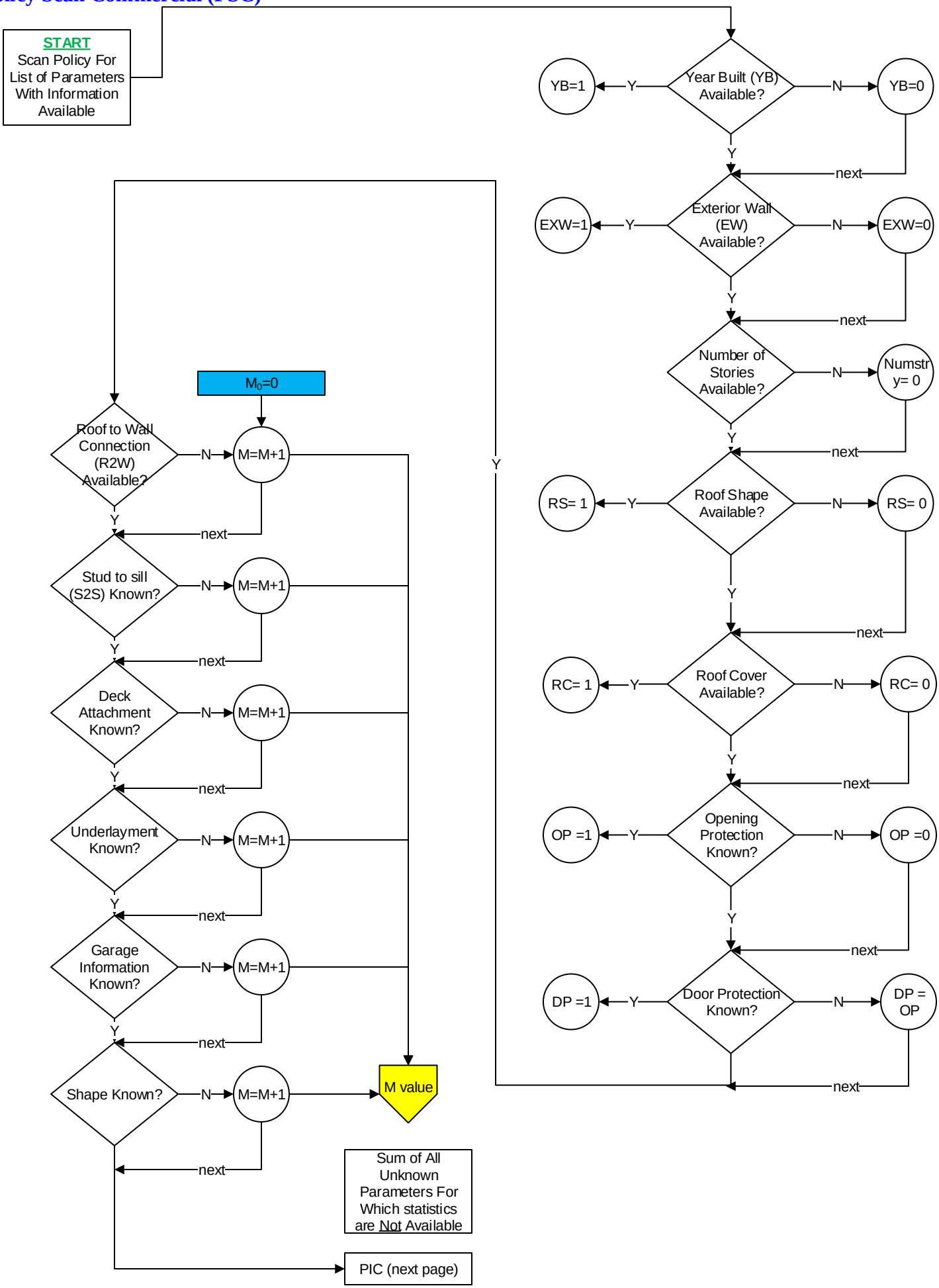
CLR V5.0a Updates

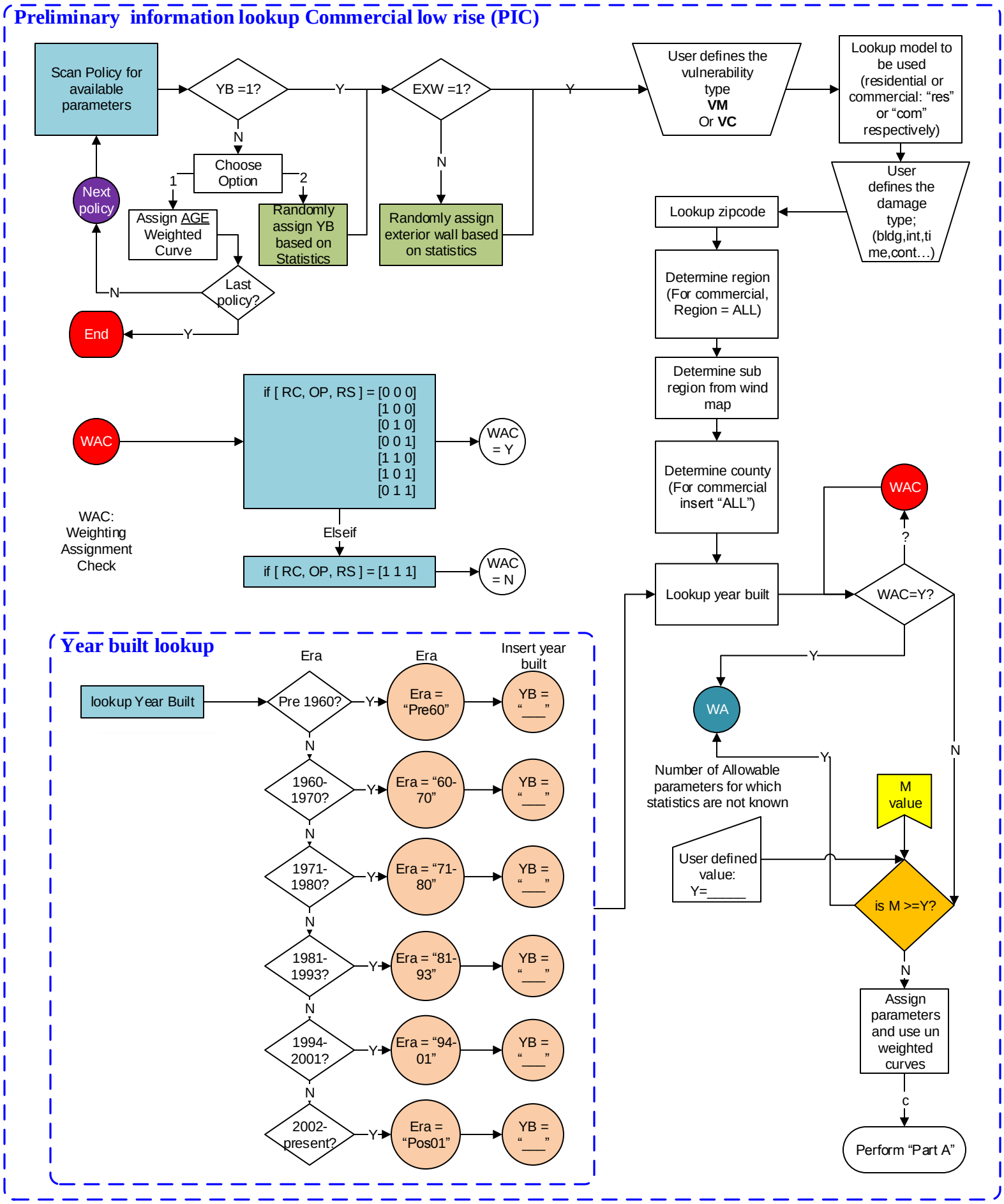
Modifications to V 2.1 for V5.0a:
The reason for the jump from V2.1 to CLR V5.0a is due to a consensus to keep the flowchart versions equivalent to the FPHLM submission version as to avoid confusion. The letter delineates which edition the flowchart represents for that version of the submission.

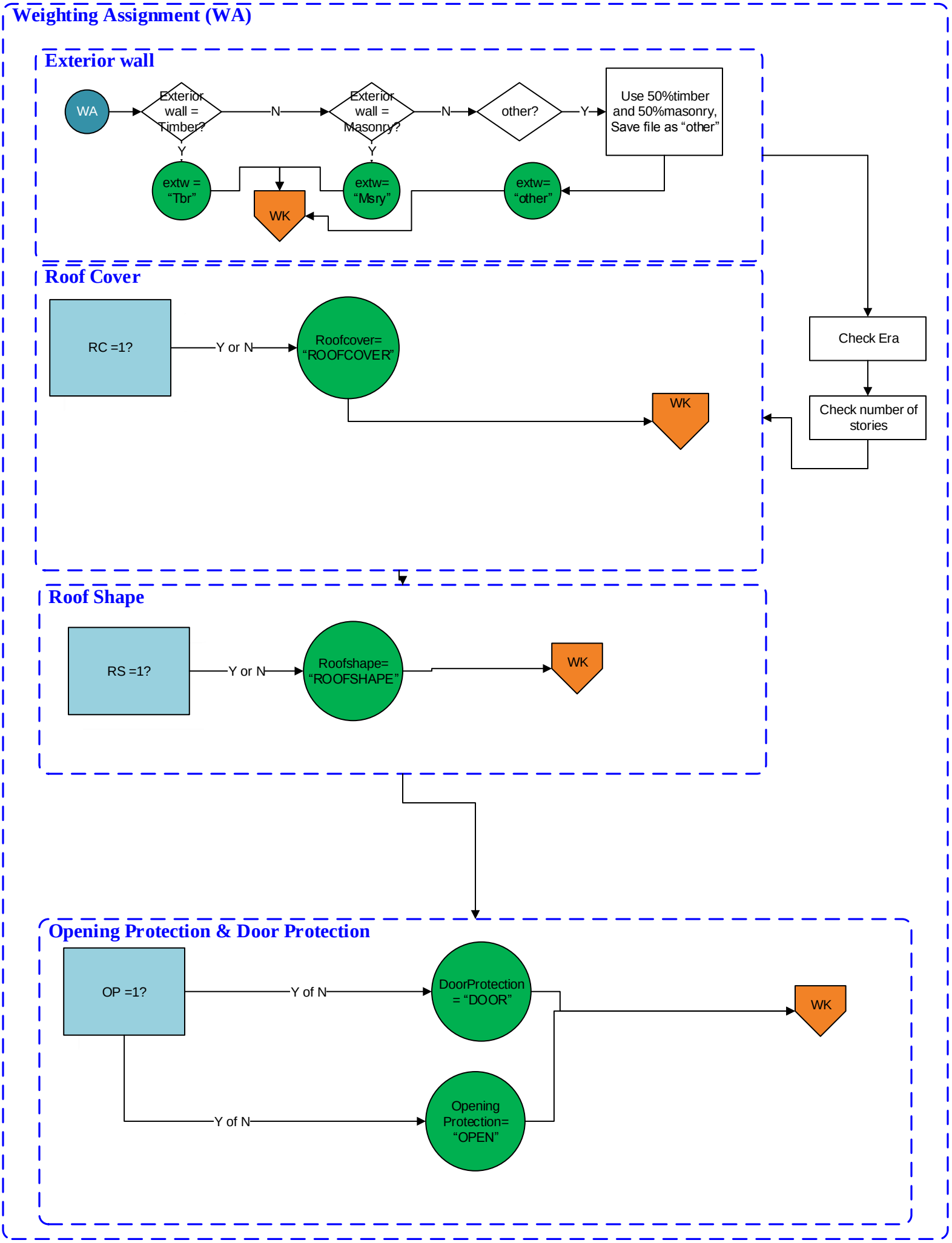
- Partially weighted matrices have been removed as an option by forcing all instances in weighted assignment check to revert to the full weighted matrix.
- Metal roof cover was restored as an option since these models have been included (Part E)
- Certain parameter classifications were changed since currently the vulnerability matrix library does not include these parameters. Namely

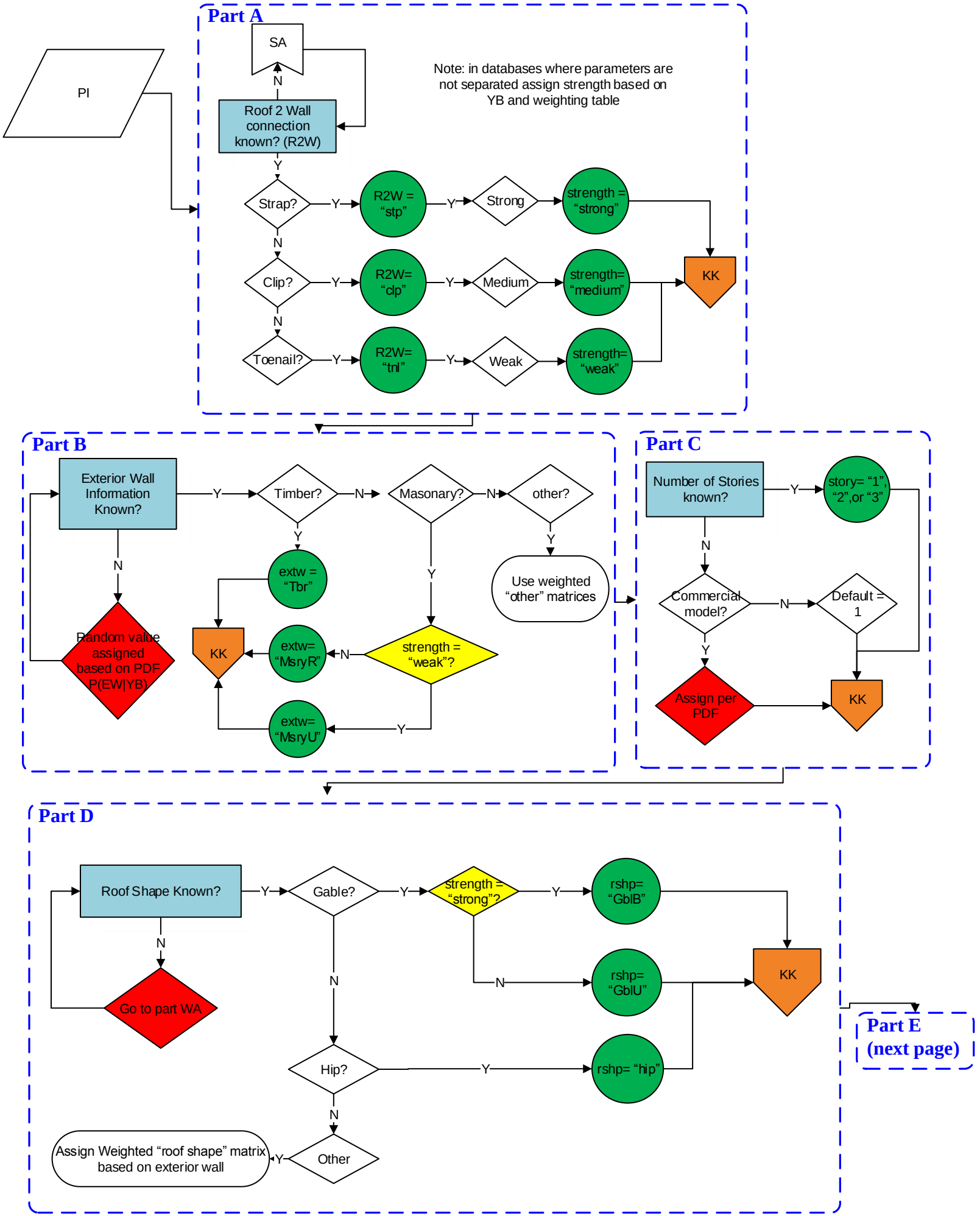
In part K "stlSht" was changed to "aluSht" to be consistent with the PR and MHR models since technically, the shutters are in fact aluminum panels and not steel.

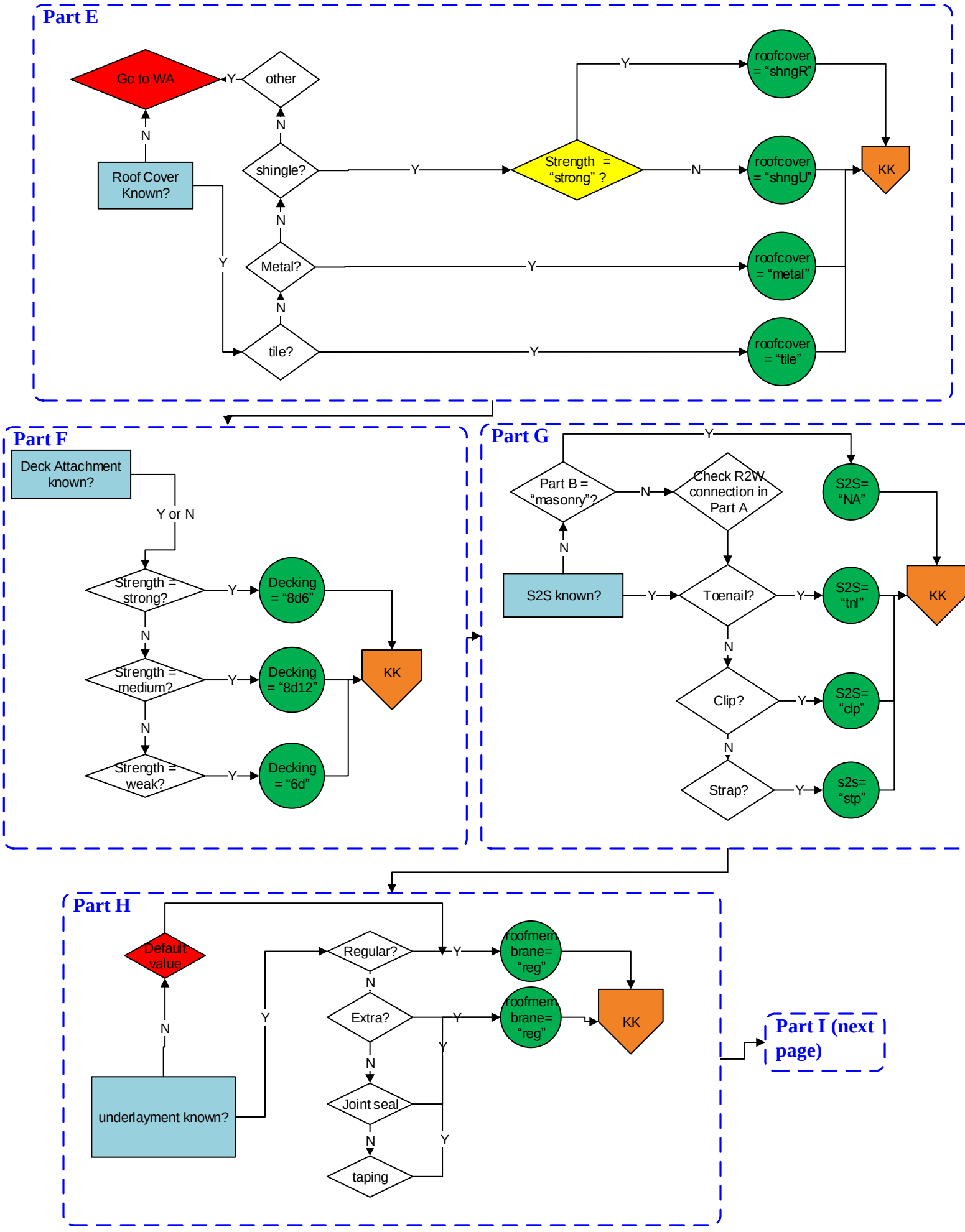
Policy Scan Commercial (PSC)

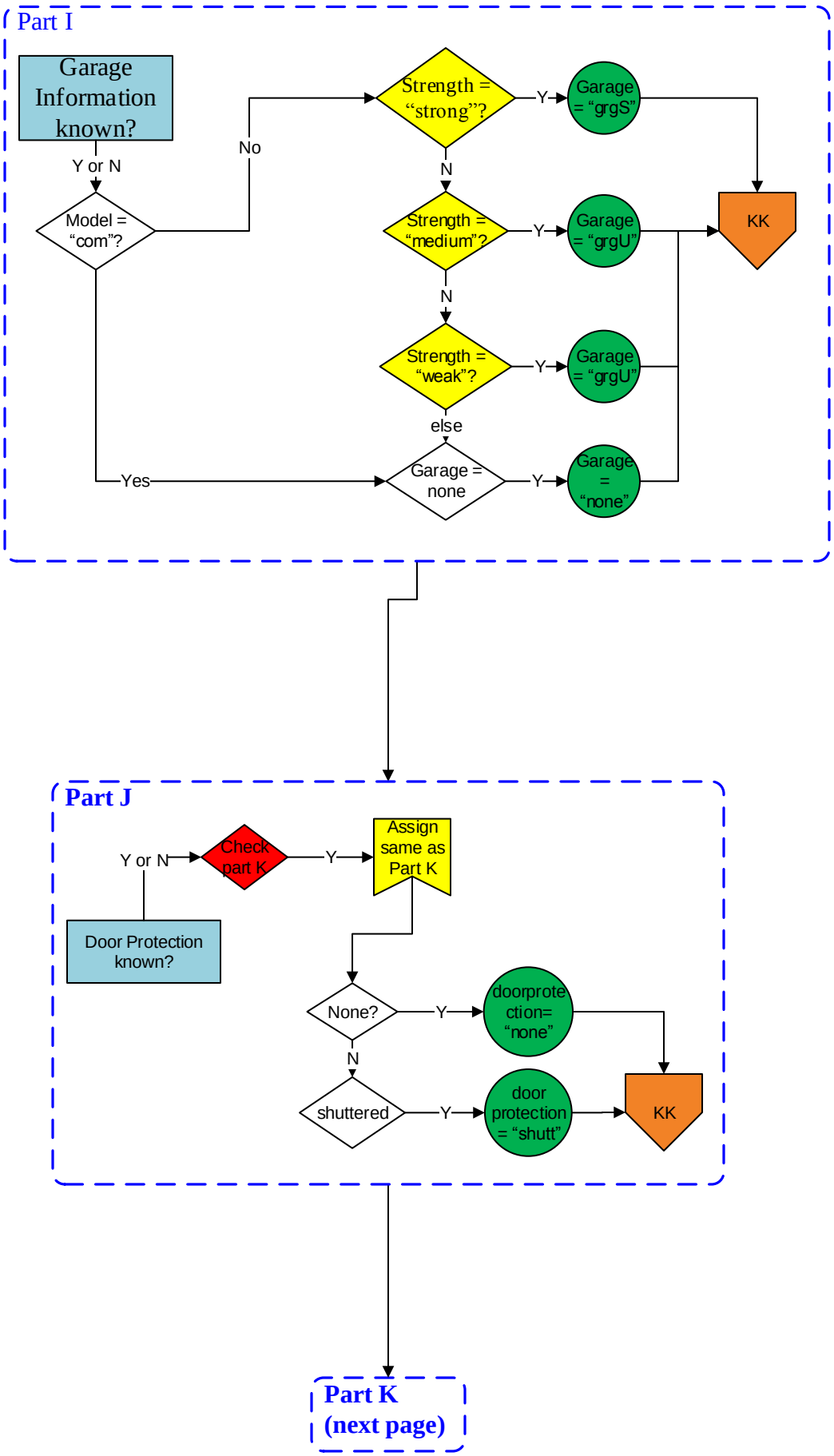


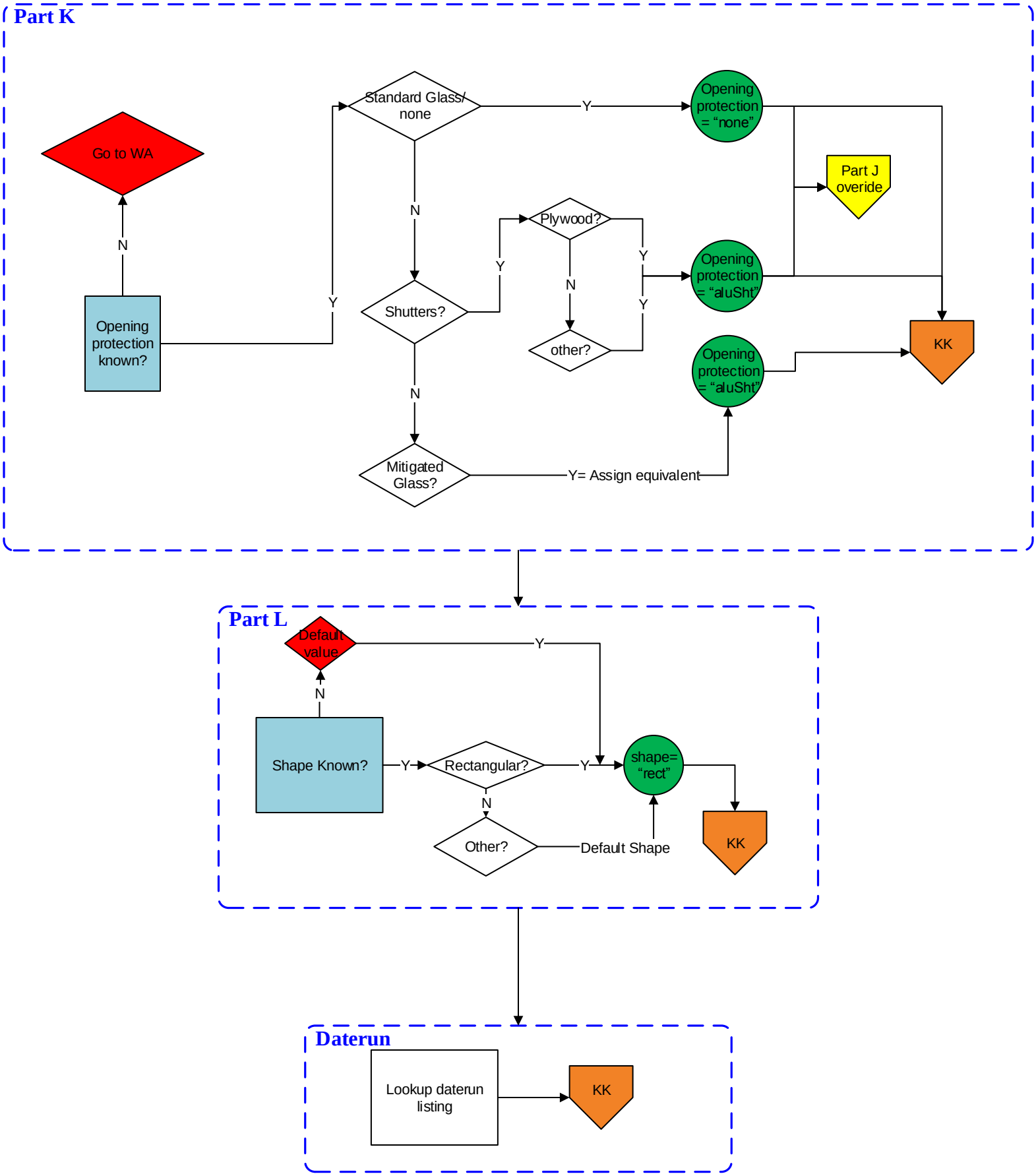

Preliminary information lookup Commercial low rise (PIC)
Scan Policy for available parameters
YB =1?
Y
N
EXW =1?
Y
N
Choose Option
1
2
Assign AGE Weighted Curve
Randomly assign YB based on Statistics
Randomly assign exterior wall based on statistics
Next policy
Last policy?
N
Y
End
User defines the vulnerability type VM Or VC
Lookup model to be used (residential or commercial: "res" or "com" respectively)
User defines the damage type; (bldg,int,time,cont…)
Lookup zipcode
Determine region (For commercial, Region = ALL)
Determine sub region from wind map
Determine county (For commercial insert "ALL")
Lookup year built
WAC
WAC=Y?
?
Y
N
WA
Number of Allowable parameters for which statistics are not known
User defined value: Y=_____
M value
is M >=Y?
N
Assign parameters and use un weighted curves
c
Perform "Part A"
WAC
if [RC, OP, RS] = [0 0 0]
[1 0 0]
[0 1 0]
[0 0 1]
[1 1 0]
[1 0 1]
[0 1 1]
WAC = Y
WAC: Weighting Assignment Check
Elseif
if [RC, OP, RS] = [1 1 1]
WAC = N
Year built lookup
lookup Year Built
Era
Pre 1960?
Y
Era = "Pre60"
Insert year built
YB = "____"
N
1960-1970?
Era = "60-70"
1971-1980?
Era = "71-80"
1981-1993?
Era = "81-93"
1994-2001?
Era = "94-01"
2002-present?
Era = "Pos01"


Weighting Assignment (WA)
Exterior wall
WA
Exterior wall = Timber?
N
Exterior wall = Masonry?
N
other?
Y
Use 50%timber and 50%masonry, Save file as “other”
Y
Y
extw = “Tbr”
WK
extw= “Msry”
extw= “other”
Roof Cover
RC =1?
Y or N
Roofcover= “ROOFCOVER”
WK
Check Era
Check number of stories
Roof Shape
RS =1?
Y or N
Roofshape= “ROOFSHAPE”
WK
Opening Protection & Door Protection
OP =1?
Y of N
DoorProtection = “DOOR”
WK
Y of N
Opening Protection= “OPEN”

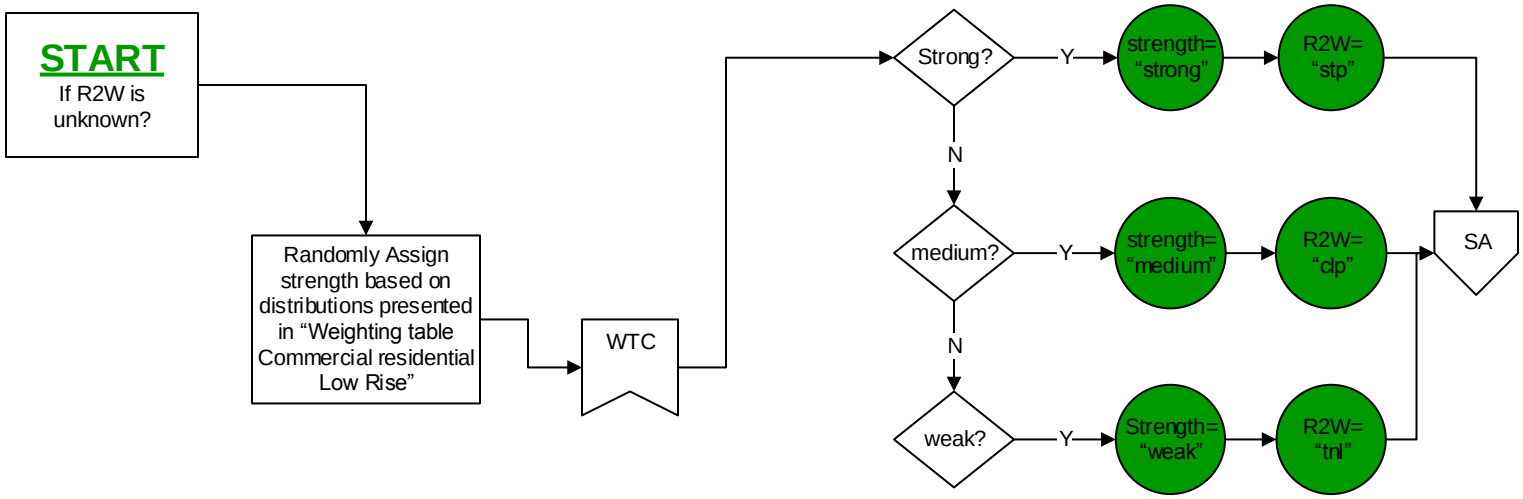

Part A
SA
PI
N
Roof 2 Wall connection known? (R2W)
Note: in databases where parameters are not separated assign strength based on YB and weighting table
Y
Strap?
Y
R2W = "stp"
Y
Strong
strength = "strong"
N
Clip?
Y
R2W= "clp"
Y
Medium
strength= "medium"
KK
N
Toenail?
Y
R2W= "tnl"
Y
Weak
strength= "weak"
Part B
Exterior Wall Information Known?
Y
Timber?
N
Masonary?
N
other?
Y
N
Y
Y
extw = "Tbr"
Use weighted "other" matrices
Random value assigned based on PDF P(EW|YB)
KK
extw= "MsryR"
N
strength = "weak"?
extw= "MsryU"
Y
Part C
Number of Stories known?
Y
story= "1", "2",or "3"
N
Commercial model?
N
Default = 1
Y
Assign per PDF
KK
Part D
Roof Shape Known?
Y
Gable?
Y
strength = "strong"?
Y
rshp= "GblB"
N
Go to part WA
N
N
rshp= "GblU"
KK
Hip?
Y
rshp= "hip"
N
Assign Weighted "roof shape" matrix based on exterior wall
Y
Other
Part E (next page)


Part E
Go to WA
Y
other
N
Roof Cover Known?
N
shingle?
Y
Strength = "strong" ?
Y
roofcover = "shngR"
N
roofcover = "shngU"
KK
N
Metal?
Y
roofcover = "metal"
Y
N
tile?
Y
roofcover = "tile"
Part F
Deck Attachment known?
Y or N
Strength = strong?
Y
Decking = "8d6"
N
Strength = medium?
Y
Decking = "8d12"
KK
N
Strength = weak?
Y
Decking = "6d"
Part G
Y
Part B = "masonry"?
N
Check R2W connection in Part A
S2S= "NA"
N
S2S known?
Y
Toenail?
Y
S2S= "tnl"
KK
N
Clip?
Y
S2S= "clp"
N
Strap?
Y
s2s= "stp"
Part H
Default value
N
underlayment known?
Y
Regular?
Y
roofmembrane= "reg"
N
Extra?
Y
roofmembrane= "reg"
KK
N
Joint seal
Y
N
taping
Y
Part I (next page)

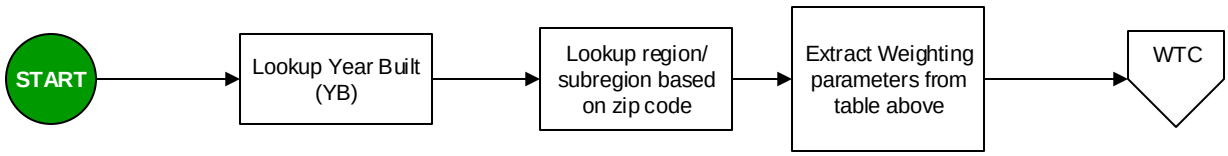

Part I
Garage Information known?
Y or N
No
Model = "com"?
Strength = "strong"?
Y
Garage = "grgS"
N
Strength = "medium"?
Y
Garage = "grgU"
N
Strength = "weak"?
Y
Garage = "grgU"
else
Garage = none
Y
Garage = "none"
Yes
KK
Part J
Y or N
Check part K
Y
Assign same as Part K
Door Protection known?
None?
Y
doorprotection= "none"
N
shuttered
Y
door protection = "shutt"
KK
Part K (next page)


Part K
Go to WA
N
Opening protection known?
Y
Standard Glass/ none
Y
Opening protection = “none”
Part J overide
N
Shutters?
Y
Plywood?
Y
N
Opening protection = “aluSht”
other?
Y
KK
N
Opening protection = “aluSht”
Mitigated Glass?
Y= Assign equivalent
Part L
Default value
Y
N
Shape Known?
Y
Rectangular?
Y
shape= “rect”
N
Other?
Default Shape
KK
Daterun
Lookup daterun listing
KK

Strength Assignment (SA)



Weighting Table Commercial Residential Low Rise

Commercial Residential Low Rise Weighting Table

	<1960	1960-70	1971-80	1981-93	1994-01	2001-pres	
Weak	0.5			0.5			HVHZ
Medium	0.5	1	1	0.5			
Strong					1	1	
Weak	1		1/3	1/3			WBDR
Medium		1	2/3	2/3	0.5		
Strong					0.5	1	
Weak	1		0.5	0.5			Inland
Medium		1	0.5	0.5	0.5		
Strong					0.5	1	
Weak	0.5						Keys
Medium	0.5	1	1	1	1/3		
Strong					2/3	1