

**HAZUS Building Attribute Rulesets - Wind - MLRI**

**Note: Defaults should be assigned to all MLRI Buildings as defined below; then rulesets should be applied to override those defaults as informed by available data.**

<b>Mreinf</b>			
<b>Valid Entries</b>	yes, no	<b>Input Variable</b>	YearBuiltNJDEP
<b>Default</b>	yes	<b>Input Variable Source</b>	Custom Inventory
<b>Years Ruleset Applies</b>	<b>Ruleset</b>	<b>Notes</b>	<b>Possible Extensions</b>
YearBuiltNJDEP ≤ Current Year	Mreinf = yes	Based on the NJ 2015 IBC and information found at <a href="https://www.fema.gov/media-library-data/20130726-1728-25045-2959/femap774.pdf">https://www.fema.gov/media-library-data/20130726-1728-25045-2959/femap774.pdf</a> , current construction of unreinforced masonry buildings are allowed in very rare circumstances. Therefore, we assume it is reinforced. Reinforced concrete started being widely used in the 1950s, and has become a requirement in building codes. Thus, this ruleset should be assumed for all years following 1960. <a href="https://www.fireengineering.com/2011/09/12/249232/havel-reinforced-masonry/#gref">https://www.fireengineering.com/2011/09/12/249232/havel-reinforced-masonry/#gref</a>	
<b>RoofCvr</b>			<i>Roof Cover</i>
<b>Valid Entries</b>	N/A, BUR, SPM	<b>Input Variable</b>	YearBuiltNJDEP, RoofShape
<b>Default</b>	N/A	<b>Input Variable Source</b>	Custom Inventory
<b>Years Ruleset Applies</b>	<b>Ruleset</b>	<b>Notes</b>	<b>Possible Extensions</b>
YearBuiltNJDEP ≥ 1975	IF RoofShape = (gable OR hip), RoofCvr = N/A IF RoofShape = flat, RoofCvr = SPM	NJ Building Code Section 1507 (in particular 1507.10 and 1507.12) address Built Up Roofs and Single Ply Membranes. However, the NJ Building Code only addresses installation and material standards of different roof covers, but not in what circumstance each must be used.  SPMs started being used in the 1960s, but different types continued to be developed through the 1980s. Today, single ply membrane roofing is the most popular flat roof option. BURs have been used for over 100 years, and although they are still used today, they are used less than SPMs. Since there is no available ruleset to be taken from the NJ Building Code, the ruleset is based off this information. Sources: <a href="https://www.spri.org/2019/01/singe-ply-roofing-101/">https://www.spri.org/2019/01/singe-ply-roofing-101/</a> , <a href="https://continuingeducation.bnppmedia.com/courses/johns-manville/understanding-single-ply-roofing-systems/">https://continuingeducation.bnppmedia.com/courses/johns-manville/understanding-single-ply-roofing-systems/</a>  Assumptions of the Ruleset: All flat roofs built before 1975 are BURs. SPMs were developed in the 1960s, and considering that there is a time lag to start consistently using new methods, SPMs rose in importance through the 1970s, becoming more popular. This ruleset assumes that all roofs built after 1975 are SPMs.	Any data from NJ on practices around BUR, SPM should be incorporated; trends presently inferred from when a technology entered the market
YearBuiltNJDEP < 1975	IF RoofShape = (gable OR hip), RoofCvr = N/A IF RoofShape = flat, RoofCvr = BUR	NJ Building Code Section 1507 (in particular 1507.10 and 1507.12) address Built Up Roofs and Single Ply Membranes. However, the NJ Building Code only addresses installation and material standards of different roof covers, but not in what circumstance each must be used.  SPMs started being used in the 1960s, but different types continued to be developed through the 1980s. Today, single ply membrane roofing is the most popular flat roof option. BURs have been used for over 100 years, and although they are still used today, they are used less than SPMs. Since there is no available ruleset to be taken from the NJ Building Code, the ruleset is based off this information. Sources: <a href="https://www.spri.org/2019/01/singe-ply-roofing-101/">https://www.spri.org/2019/01/singe-ply-roofing-101/</a> , <a href="https://continuingeducation.bnppmedia.com/courses/johns-manville/understanding-single-ply-roofing-systems/">https://continuingeducation.bnppmedia.com/courses/johns-manville/understanding-single-ply-roofing-systems/</a>  Assumptions of the Ruleset: All flat roofs built before 1975 are BURs. SPMs were developed in the 1960s, and considering that there is a time lag to start consistently using new methods, SPMs rose in importance through the 1970s, becoming more popular. This ruleset assumes that all roofs built after 1975 are SPMs.	Any data from NJ on practices around BUR, SPM should be incorporated; trends presently inferred from when a technology entered the market
<b>RoofQual</b>			<i>Roof Quality</i>
<b>Valid Entries</b>	N/A, poor, good	<b>Input Variable</b>	YearBuiltNJDEP, RoofShape, RoofCvr
<b>Default</b>	good	<b>Input Variable Source</b>	Custom Inventory
<b>Years Ruleset Applies</b>	<b>Ruleset</b>	<b>Notes</b>	<b>Possible Extensions</b>
YearBuiltNJDEP ≤ Current Year	IF RoofShape = gable OR hip, RoofQual = N/A IF RoofShape = flat & RoofCvr = BUR & YearBuiltNJDEP < (Current Year - 30), RoofQual = poor IF RoofShape = flat & RoofCvr = BUR & YearBuiltNJDEP ≥ (Current Year - 30), RoofQual = good IF RoofShape = flat & RoofCvr = SPM & YearBuiltNJDEP < (Current Year - 35), RoofQual = poor IF RoofShape = flat & RoofCvr = SPM & YearBuiltNJDEP ≥ (Current Year - 35), RoofQual = good	Nothing in NJ Building Code or in the Hazus manual specifies what constitutes "good" and "poor" roof conditions, so ruleset is dependant on the age of the roof and average lifespan of BUR and SPM roofs. Information taken from websites below. The average lifespan of a BUR roof is 30 years and the average lifespan of a SPM is 35 years. Therefore, BURs installed before 1989 (2019-30) are in poor condition, and SPMs installed before 1984 (2019-35) are in poor condition. Sources: <a href="https://www.thebalancesmb.com/built-up-roof-types-advantages-repairs-844654">https://www.thebalancesmb.com/built-up-roof-types-advantages-repairs-844654</a> <a href="https://www.roofedright.com/FlatRoof-SinglePly">https://www.roofedright.com/FlatRoof-SinglePly</a>	Further information about roof cover, as well as roof replacements or renovations should be included at the building level if available
<b>MetalRDA</b>			<i>Metal Roof Deck Attachment</i>
<b>Valid Entries</b>	standard, superior	<b>Input Variable</b>	YearBuiltNJDEP, DSWII
<b>Default</b>	standard	<b>Input Variable Source</b>	Custom Inventory
<b>Years Ruleset Applies</b>	<b>Ruleset</b>	<b>Notes</b>	<b>Possible Extensions</b>

YearBuiltNJDEP > 2000	<p>IF DSWII ≤ 142 mph, Metal-RDA = standard</p> <p>IF DSWII &gt; 142 mph, Metal-RDA = superior</p>	<p>Present to 2006:</p> <p>1507.2.8.1 High Wind Attachment. Underlayment applied in areas subject to high winds (Vasd greater than 110 mph as determined in accordance with Section 1609.3.1) shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's instructions. Fasteners are to be applied along the overlap not more than 36 inches on center. Underlayment installed where Vasd, in accordance with section 1609.3.1 equals or exceeds 120 mph shall be attached in a grid pattern of 12 inches between side laps with a 6-inch spacing at the side laps.</p> <p>1507.2.8.1 High Wind Attachment. Underlayment applied in areas subject to high winds (Vasd greater than 110 mph as determined in accordance with Section 1609.3.1) shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's instructions. Fasteners are to be applied along the overlap not more than 36 inches on center. Underlayment installed where Vasd, in accordance with section 1609.3.1 equals or exceeds 120 mph shall be attached in a grid pattern of 12 inches between side laps with a 6-inch spacing at the side laps.</p> <p>1507.2.8.1 High Wind Attachment. Underlayment applied in areas subject to high winds (Vasd greater than 110 mph as determined in accordance with Section 1609.3.1) shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's instructions. Fasteners are to be applied along the overlap not more than 36 inches on center. Underlayment installed where Vasd, in accordance with section 1609.3.1 equals or exceeds 120 mph shall be attached in a grid pattern of 12 inches between side laps with a 6-inch spacing at the side laps.</p> <p>2000-2006:</p> <p>1507.2.8.1 High Wind Attachment. Underlayment applied in areas subject to high winds (greater than 110 mph) shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's instructions. Fasteners are to be applied along the overlap not more than 36 inches on center. According to Figure 1609, this is basic wind speed.</p> <p>convert Vasd to Vult using <math>Vasd = \sqrt{0.6} Vult</math> --- 110 -&gt; 142</p>	
YearBuiltNJDEP ≤ 2000	Metal-RDA = standard	<p>There is no mention of straps or enhanced tie-downs of any kind in the BOCA codes, and there is no description of these adoptions in IBHS reports or the New Jersey Construction Code Communicator.</p> <p>Although there is no explicit information, it seems that hurricane straps really only came into effect in Florida after Hurricane Andrew (1992), and likely it took several years for these changes to happen. Because Florida is the leader in adopting hurricane protection measures into codes and because there is no mention of shutters or straps in the BOCA codes, it is assumed that New Jersey did not adopt these standards until the 2000 IBC.</p> <p><a href="https://www.insurancejournal.com/news/southeast/2007/05/18/79827.htm">https://www.insurancejournal.com/news/southeast/2007/05/18/79827.htm</a></p> <p><a href="https://forum.nachi.org/t/hurricane-straps/4617">https://forum.nachi.org/t/hurricane-straps/4617</a></p> <p><a href="http://www.floridaretrofits.com/service/hurricaneStrapsClips">http://www.floridaretrofits.com/service/hurricaneStrapsClips</a></p> <p>Thus, all connections before 2000 are assumed to be standard.</p>	