

# ENVIRONMENTAL PRODUCT DECLARATION



Environmental Product Declaration for concrete products produced by **HOLCIM EL SALVADOR AT SANTA TECLA** facility in La Libertad, El Salvador.

## ADMINISTRATIVE INFORMATION

### International Certified Environmental Product Declaration

<b>Declared Product:</b>	This Environmental Product Declaration (EPD) covers concrete products produced by Holcim Nicaragua. Declared unit: 1 m <sup>3</sup> of concrete
<b>Declaration Owner:</b>	Holcim El Salvador S/N Calle Holcim y Av. El Espino, Madre Selva Antiguo Cuascatlán, El Salvador <a href="http://www.holcim.com.sv">www.holcim.com.sv</a>
<b>Program Operator:</b>	Labeling Sustainability Address, 11670 W Sunset Blvd. City, State, Los Angeles, CA <a href="http://www.labelingsustainability.com">www.labelingsustainability.com</a>
<b>Product Category Rule:</b>	Core PCR: ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services SubPCR: NSF International (March 2020). Product Category Rul (PCR) for Environmental Product Declarations (EPD) PCR for Concrete, v2.1 Sub PCR Program Operator: NSF International Sub-category PCR review was conducted by: Thomas P. Gloria, Ph. D. of Industrial Ecology Consultants: 35 Bracebridge, Rd., Newton, MA 02459-1728, <a href="mailto:t.gloria@industrial-ecology.com">t.gloria@industrial-ecology.com</a> . Dr. Michael Overcash of Environmental Clarity: 2908 Chipmunk Lane, Raleigh, NC 27607-3117, <a href="mailto:mrovercash@earthlink.net">mrovercash@earthlink.net</a> . Mr. Bill Stough of Sustainable Research Group: PO Box 1684, Grand Rapids, MI 49501-1684, <a href="mailto:bstough@sustainableresearchgroup.com">bstough@sustainableresearchgroup.com</a> .
<b>Independent LCA Reviewer and EPD Verifier:</b>	This EPD was independently verified in accordance with ISO 14025 and ISO 21930. The life cycle assessment was independently reviewed in accordance ISO 14044 and the referenced PCR. Independent verification of the declaration, according to ISO 14025:2006 Internal <input type="checkbox"/> ; External <input checked="" type="checkbox"/> Third Party Verifier Geoffrey Guest, Certified 3rd Party Verifier under the International EPD Program ( <a href="http://www.environdec.com">www.environdec.com</a> ), CSA Group ( <a href="http://www.csaregistry.ca">www.csaregistry.ca</a> )
<b>Date of Issue:</b>	06 January 2023
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## COMPANY DESCRIPTION

Holcim El Salvador as part of the Holcim Group, a world leader in innovative and sustainable solutions for construction, is making it possible to have greener cities, smarter infrastructures and improve the standard of living of people around the world. With sustainability at the core of its strategy, Holcim is becoming a Net Zero company, where its people and communities are the foundation of its success. The company is driving circular construction as a world leader in recycling to build more with less. Holcim El Salvador produces and markets cement and ready-mix concrete, as well as other products and solutions for construction. In El Salvador, the company has more than 500 people who are passionate about building progress for people and the planet. It has a nationwide presence through 2 cement plants with a current installed capacity to produce 1.9 million tons of cement per year, 6 fixed ready-mix concrete plants, corporate offices, 1 Geocycle platform, 1 aggregates plant, 1 Distribution Center Disensa, hundreds of Disensa points of sale throughout the country and the Holcim Foundation.

## STUDY GOAL

The intended application of this life cycle assessment (LCA) is to comply with the procedures for creating a Type III environmental product declaration (EPD) and publish the EPD for public review on the website, <http://labelingsustainability.com/>. This level of study is in accordance with EPD Product Category Rule (PCR) for Ready Mix Concrete published by NSF International (2019) and is a sub-PCR of International Standards Organization (ISO) 21930:2017 Sustainability in buildings and civil works - Core rules for EPDs of construction products and services; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations-Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework. The performance of this study and its subsequent publishing is in alignment with the business-to-business (B2B) communication requirements for the environmental assessment of building products. The study does not intend to support comparative assertions and is intended to be disclosed to the public.

This project report was commissioned to differentiate Holcim El Salvador from their competition for the following reasons: generate an advantage for the organization; offer customers information to help them make informed product decisions; improve the environmental performance of Holcim El Salvador by continuously measuring, controlling and reducing the environmental impacts of their products; help project facilitators working on Leadership in Energy and Environmental Design (LEED) projects achieve their credit goal; and to strengthen Holcim El Salvador's license to operate in the community. The intended audience for this LCA report is Holcim El Salvador's employees, their suppliers, project specifiers of their products, architects, and engineers. The EPD report is also available for policy makers, government officials interested in sustainability, academic professors, and LCA professionals. This LCA report does not include product comparisons from other facilities.

## DESCRIPTION OF PRODUCT AND SCOPE

This EPD reports on 149 concrete mixes manufactured at the Holcim El Salvador concrete facility in Santa Tecla, El Salvador



This LCA assumes the impacts from products manufactured in accordance with the standards outlined in this report. This LCA is a cradle-to-gate study, and therefore, stages extending beyond the plant gate are not included in this LCA. Excluded stages include transportation of the manufactured material to the construction site; on-site construction processes and components; building (infrastructure) use and maintenance; and "end-of-life" effects.

## READY MIX CONCRETE DESIGN SUMMARY

The following tables provide a list of ready mix concrete products considered in this EPD along with key performance parameters.

### Mix designs: 0 to 15 MPa:

Table 1: Declared products with Mix designs: 0 to 15 MPa considered in this environmental product declaration.

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H <sub>2</sub> O to cement ratio
<b>1</b>	100 BOMBA ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.7000
<b>2</b>	100 BOMBA CON TEMPERATURA ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.7000
<b>3</b>	100 BOMBA CON RETARDANTE ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.7000
<b>4</b>	100 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.7000
<b>5</b>	100 BOMBA CON FIBRA ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.6923
<b>6</b>	100 BOMBA CON FIBRA Y RETARDANTE ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.6923
<b>7</b>	100 BOMBA CON FIBRA Y TEMPERATURA ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.6923
<b>8</b>	100 DIRECTO ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.6800
<b>9</b>	100 DIRECTO CON TEMPERATURA ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.6800
<b>10</b>	100 DIRECTO CON RETARDANTE ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.6538
<b>11</b>	100 DIRECTO CON RETARDANTE Y TEMPERATURA ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.6538



<b>12</b>	100 DIRECTO CON FIBRA ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.6923
<b>13</b>	100 DIRECTO CON FIBRA Y RETARDANTE ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.6731
<b>14</b>	100 DIRECTO CON FIBRA Y TEMPERATURA ECOPACT	10 MPa 28d strength ready mix concrete.	Ready Mix	10	0.6923
<b>15</b>	140 DIRECTO ECOPACT	14 MPa 28d strength ready mix concrete.	Ready Mix	14	0.6140
<b>16</b>	140 DIRECTO CON RETARDANTE ECOPACT	14 MPa 28d strength ready mix concrete.	Ready Mix	14	0.6140
<b>17</b>	140 DIRECTO CON TEMPERATURA ECOPACT	14 MPa 28d strength ready mix concrete.	Ready Mix	14	0.6140
<b>18</b>	140 DIRECTO CON RETARDANTE Y TEMPERATURA ECOPACT	14 MPa 28d strength ready mix concrete.	Ready Mix	14	0.6140
<b>19</b>	140 BOMBA ECOPACT	14 MPa 28d strength ready mix concrete.	Ready Mix	14	0.6316
<b>20</b>	140 BOMBA CON RETARDANTE ECOPACT	14 MPa 28d strength ready mix concrete.	Ready Mix	14	0.6316
<b>21</b>	140 BOMBA CON TEMPERATURA ECOPACT	14 MPa 28d strength ready mix concrete.	Ready Mix	14	0.6316
<b>22</b>	140 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT	14 MPa 28d strength ready mix concrete.	Ready Mix	14	0.6316

### Mix designs: 15 to 20 MPa:

Table 2: Declared products with Mix designs: 15 to 20MPa considered in this environmental product declaration.

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H <sub>2</sub> O to cement ratio
<b>23</b>	180 BOMBA ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5833
<b>24</b>	180 BOMBA CON TEMPERATURA ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5833
<b>25</b>	180 BOMBA CON RETARDANTE ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5833
<b>26</b>	180 BOMBA CON RETARDANTE Y	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5833



	TEMPERATURA ECOPACT				
<b>27</b>	180 BOMBA CON FIBRA ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5806
<b>28</b>	180 BOMBA CON FIBRA Y RETARDANTE ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5806
<b>29</b>	180 BOMBA CON FRIBRA Y TEMPERATURA ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5806
<b>30</b>	180 DIRECTO ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5667
<b>31</b>	180 DIRECTO CON TEMPERATURA ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5667
<b>32</b>	180 DIRECTO CON RETARDANTE ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5574
<b>33</b>	180 DIRECTO CON RETARDANTE Y TEMPERATURA ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5574
<b>34</b>	180 DIRECTO CON FIBRA ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5806
<b>35</b>	180 DIRECTO CON FIBRA Y RETARDANTE ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5806
<b>36</b>	180 DIRECTO CON FRIBRA Y TEMPERATURA ECOPACT	18 MPa 28d strength ready mix concrete.	Ready Mix	18	0.5806

### Mix designs: 21 to 25 MPa:

Table 3: Declared products with Mix designs: 21 to 25MPa considered in this environmental product declaration.

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H <sub>2</sub> O to cement ratio
<b>37</b>	210 DIRECTO ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4722
<b>38</b>	210 DIRECTO CON TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4722
<b>39</b>	210 DIRECTO CON RETARDANTE ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4722
<b>40</b>	210 DIRECTO CON RETARDANTE Y	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4722



	TEMPERATURA ECOPACT				
<b>41</b>	210 DIRECTO CON FIBRA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4865
<b>42</b>	210 DIRECTO CON FIBRA Y RETARDANTE ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4865
<b>43</b>	210 DIRECTO CON FRIBRA Y TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4865
<b>44</b>	210 BOMBA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5000
<b>45</b>	210 BOMBA CON TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5000
<b>46</b>	210 BOMBA CON RETARDANTE ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5143
<b>47</b>	210 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5143
<b>48</b>	210 BOMBA CON FIBRA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5000
<b>49</b>	210 BOMBA CON FIBRA Y RETARDANTE ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5000
<b>50</b>	210 BOMBA CON FRIBRA Y TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5000
<b>51</b>	210 BOMBA PP ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5000
<b>52</b>	210 BOMBA PP CON TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5000
<b>53</b>	210 SEMIFLUIDO ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4800
<b>54</b>	210 SEMIFLUIDO CON TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4800
<b>55</b>	210 SEMIFLUIDO CON RETARDANTE ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4800
<b>56</b>	210 SEMIFLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4800



<b>57</b>	210 SEMIFLUIDO CON FIBRA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5067
<b>58</b>	210 SEMIFLUIDO CON FIBRA Y RETARDANTE ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5067
<b>59</b>	210 SEMIFLUIDO CON FIBRA Y TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.5067
<b>60</b>	210 SEMIFLUIDO 3/8 ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4634
<b>61</b>	210 SEMIFLUIDO 3/8 CON RETARDANTE ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4578
<b>62</b>	210 SEMIFLUIDO 3/8 CON TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4634
<b>63</b>	210 SEMIFLUIDO 3/8 CON RETARDANTE Y TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4578
<b>64</b>	210 FLUIDO ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4868
<b>65</b>	210 FLUIDO CON TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4868
<b>66</b>	210 FLUIDO CON RETARDANTE ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4868
<b>67</b>	210 FLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4868
<b>68</b>	210 FLUIDO CON FIBRA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4805
<b>69</b>	210 FLUIDO CON FIBRA Y RETARDANTE ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4805
<b>70</b>	210 FLUIDO CON FIBRA Y TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4805
<b>71</b>	210 FLUIDO 3/8 ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4588
<b>72</b>	210 FLUIDO 3/8 CON RETARDANTE ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4588



<b>73</b>	210 FLUIDO 3/8 CON TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4588
<b>74</b>	210 FLUIDO 3/8 CON RETARDANTE Y TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4588
<b>75</b>	210 LANZADO ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4070
<b>76</b>	210 LANZADO CON TEMPERATURA ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.4070
<b>77</b>	210 PERMEABLE ECOPACT	21 MPa 28d strength ready mix concrete.	Ready Mix	21	0.2041
<b>78</b>	245 DIRECTO ECOPACT	24 MPa 28d strength ready mix concrete.	Ready Mix	24	0.4605
<b>79</b>	245 BOMBA ECOPACT	24 MPa 28d strength ready mix concrete.	Ready Mix	24	0.4675
<b>80</b>	250 DIRECTO ECOPACT	25 MPa 28d strength ready mix concrete.	Ready Mix	25	0.4605
<b>81</b>	250 BOMBA ECOPACT	25 MPa 28d strength ready mix concrete.	Ready Mix	25	0.4675

### Mix designs: 26 to 30 MPa:

Table 4: Declared products with Mix designs: 26 to 30MPa considered in this environmental product declaration.

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H <sub>2</sub> O to cement ratio
<b>82</b>	280 DIRECTO ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4217
<b>83</b>	280 DIRECTO CON TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4217
<b>84</b>	280 DIRECTO CON RETARDANTE ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4217
<b>85</b>	280 DIRECTO CON RETARDANTE Y TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4217
<b>86</b>	280 DIRECTO CON FIBRA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4286
<b>87</b>	280 DIRECTO CON FIBRA Y RETARDANTE ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4286
<b>88</b>	280 DIRECTO CON FIBRA Y TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4286



<b>89</b>	280 BOMBA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4368
<b>90</b>	280 BOMBA CON TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4368
<b>91</b>	280 BOMBA CON RETARDANTE ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4253
<b>92</b>	280 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4253
<b>93</b>	280 BOMBA CON FIBRA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4318
<b>94</b>	280 BOMBA CON FIBRA Y RETARDANTE ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4318
<b>95</b>	280 BOMBA CON FIBRA Y TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4318
<b>96</b>	280 BOMBA PP ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4368
<b>97</b>	280 BOMBA PP CON TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4368
<b>98</b>	280 SEMIFLUIDO ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4318
<b>99</b>	280 SEMIFLUIDO CON TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4318
<b>100</b>	280 SEMIFLUIDO CON RETARDANTE ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4318
<b>101</b>	280 SEMIFLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4318
<b>102</b>	280 SEMIFLUIDO CON FIBRA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4382
<b>103</b>	280 SEMIFLUIDO CON FIBRA Y RETARDANTE ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4382
<b>104</b>	280 SEMIFLUIDO CON FIBRA Y TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4382
<b>105</b>	280 SEMIFLUIDO 3/8 ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4043



<b>106</b>	280 SEMIFLUIDO 3/8 CON RETARDANTE ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4000
<b>107</b>	280 SEMIFLUIDO 3/8 CON TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4043
<b>108</b>	280 SEMIFLUIDO 3/8 CON RETARDANTE Y TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4000
<b>109</b>	280 FLUIDO ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4222
<b>110</b>	280 FLUIDO CON TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4222
<b>111</b>	280 FLUIDO CON RETARDANTE ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4176
<b>112</b>	280 FLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4176
<b>113</b>	280 FLUIDO CON FIBRA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4286
<b>114</b>	280 FLUIDO CON FIBRA Y RETARDANTE ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4286
<b>115</b>	280 FLUIDO CON FIBRA Y TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.4286
<b>116</b>	280 FLUIDO 3/8 ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.3878
<b>117</b>	280 FLUIDO 3/8 CON RETARDANTE ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.3878
<b>118</b>	280 FLUIDO 3/8 CON TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.3878
<b>119</b>	280 FLUIDO 3/8 CON RETARDANTE Y TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.3878
<b>120</b>	280 LANZADO ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.3838
<b>121</b>	280 LANZADO CON TEMPERATURA ECOPACT	27 MPa 28d strength ready mix concrete.	Ready Mix	27	0.3838



<b>122</b>	300 BOMBA ECOPACT	29 MPa 28d strength ready mix concrete.	Ready Mix	29	0.3619
<b>123</b>	300 BOMBA CON RETARDANTE ECOPACT	29 MPa 28d strength ready mix concrete.	Ready Mix	29	0.3619
<b>124</b>	300 BOMBA CON TEMPERATURA ECOPACT	29 MPa 28d strength ready mix concrete.	Ready Mix	29	0.3619
<b>125</b>	300 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT	29 MPa 28d strength ready mix concrete.	Ready Mix	29	0.3619

### Mix designs: 31 to 35 MPa:

Table 5: Declared products with Mix designs: 31 to 35 MPa considered in this environmental product declaration.

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H <sub>2</sub> O to cement ratio
<b>126</b>	350 BOMBA ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3551
<b>127</b>	350 BOMBA CON RETARDANTE ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3551
<b>128</b>	350 BOMBA CON TEMPERATURA ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3551
<b>129</b>	350 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3551
<b>130</b>	350 SEMIFLUIDO ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3824
<b>131</b>	350 SEMIFLUIDO CON RETARDANTE ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3824
<b>132</b>	350 SEMIFLUIDO CON TEMPERATURA ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3824
<b>133</b>	350 SEMIFLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3824
<b>134</b>	350 FLUIDO ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3578
<b>135</b>	350 FLUIDO CON RETARDANTE ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3578
<b>136</b>	350 FLUIDO CON TEMPERATURA ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3578



<b>137</b>	350 FLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT	34 MPa 28d strength ready mix concrete.	Ready Mix	34	0.3578
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**Mix designs: 41 to 45 MPa:**

Table 6: Declared products with Mix designs: 41 to 45MPa considered in this environmental product declaration.

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H <sub>2</sub> O to cement ratio
<b>138</b>	420 BOMBA ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3762
<b>139</b>	420 BOMBA CON RETARDANTE ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3762
<b>140</b>	420 BOMBA CON TEMPERATURA ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3762
<b>141</b>	420 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3762
<b>142</b>	420 SEMIFLUIDO ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3654
<b>143</b>	420 SEMIFLUIDO CON RETARDANTE ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3654
<b>144</b>	420 SEMIFLUIDO CON TEMPERATURA ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3654
<b>145</b>	420 SEMIFLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3654
<b>146</b>	420 FLUIDO ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3654
<b>147</b>	420 FLUIDO CON RETARDANTE ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3654
<b>148</b>	420 FLUIDO CON TEMPERATURA ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3654
<b>149</b>	420 FLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT	41 MPa 28d strength ready mix concrete.	Ready Mix	41	0.3654



## READY MIX CONCRETE DESIGN COMPOSITION

The following figures provide mass breakdown (kg per functional unit) of the material composition of each ready mix concrete design considered. Please note that the presented breakdown has been randomly altered by +/-10%, and is therefore only an approximation; this manipulation is to ensure confidentiality.

Table 7: Ready mix concrete composition

Product Components	Raw Material, weight%
Cement	Proprietary
Aggregates	30-60.00
Others	0.01-5.00
Total	100.00

## A1 RAW MATERIAL RECYCLED CONTENT AND MATERIAL LOSSES –

The following table provides a list of the raw material inputs (module A1) across all products considered, their recyclability content and assumed material losses.

Table 8: Module A1 raw material inputs, the recyclability content and assumed material losses (dry basis)

product.name	mix.category	primary.content	post.industrial.content	post.consumer.content	material.losses
Cemento Fuerte Industrial	Cemento Fuerte Industrial	1	0	0	0
Fiber	polypropylene, granulate	1	0	0	0.05
Water	tap water	1	0	0	0.05
Gravel	gravel, crushed	1	0	0	0.05
River sand 1	sand	1	0	0	0.05
River sand 2	sand	1	0	0	0.05
Additives	chemical, organic	1	0	0	0.05

## SYSTEM BOUNDARIES

The following figure depicts the cradle-to-gate system boundary considered in this study:



## Life Cycle Impacts

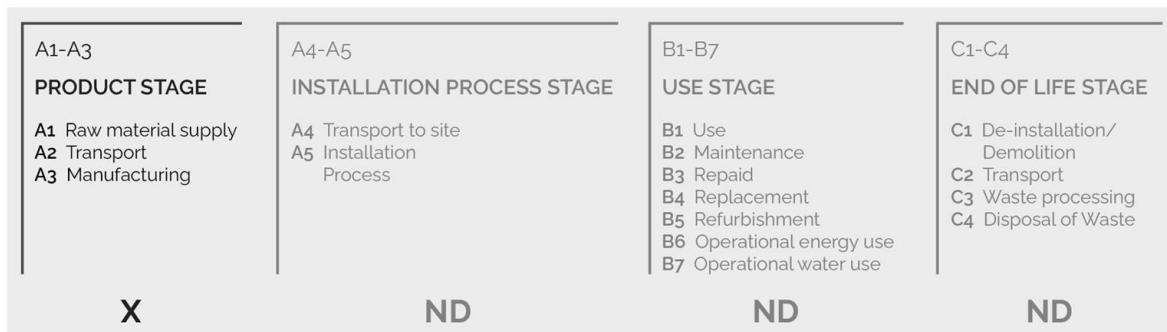


Figure 1: General life cycle phases for consideration in a construction works system.

This is a Cradle-to-gate life cycle assessment and the following life cycle stages are included in the study:

- A1: Raw material supply (upstream processes) - Extraction, handling, and processing of the materials used in manufacturing the declared products in this LCA.
- A2: Transportation - Transportation of A1 materials from the supplier to the "gate" of the manufacturing facility (i.e. A3).
- A3: Manufacturing (core processes)- The energy and other utility inputs used to store, move, and manufacturer the declared products and to operate the facility.

As according to the PCR, the following figure illustrates the general activities and input requirements for producing ready mix concrete products and is not necessarily exhaustive.

## System Boundary

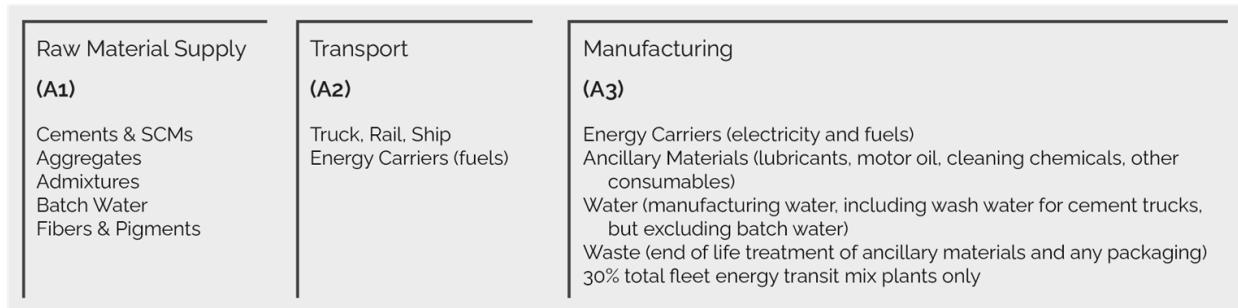


Figure 2: General system inputs considered in the product system and categorized by modules in scope

In addition, as according to the relevant PCR, the following requirements are excluded from this study:

- Production, manufacture, and construction of A3 building/capital goods and infrastructure.
- Production and manufacture of steel production equipment, steel delivery vehicles, earth-moving equipment, and laboratory equipment.
- Personnel-related activities (travel, furniture, office supplies).
- Energy use related to company management and sales activities.



For this LCA the manufacturing plant, owned and operated by Holcim El Salvador, is located at their Planta Santa Tecla facility in El Salvador. All operating data is formulated using the actual data from Holcim El Salvador's plant at the above location, including water, energy consumption and waste generation. All inputs for this system boundary are calculated for the plant.

This life cycle inventory was organized in a spreadsheet and was then input into an RStudio environment where pre-calculated LCIA results for relevant products/activities stemming from the ecoinvent v3.8 database and a local EPD database in combination with primary data from Holcim El Salvador were utilized. Explanations of the contribution of each data source to this study are outlined in the section 'Data Sources and Quality'. Further LCI details for each declared product are provided in the sections 'Detailed LCI tables' and 'Transport tables' of the detailed LCA report. A parameter uncertainty analysis was also performed where key statistical results (e.g. min/mean/max etc.) are provided in the detailed LCA report.

## CUT-OFF CRITERIA

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ISO 14044:2006 and the focus PCR requires the LCA model to contain a minimum of 95% of the total inflows (mass and energy) to the upstream and core modules be included in this study. The cut-off criteria were applied to all other processes unless otherwise noted above as follows. A 1% cut-off is considered for all renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process where the total of the neglected inputs does not exceed 5%.

## DATA SOURCES AND DATA QUALITY ASSESSMENT

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**Raw material transport:** A combination of actual mode/distance combinations were assumed for key bulk materials whereas ecoinvent default multi-modal market mix distances were assumed for other inputs where no original data could be provided.

**Electricity:** Electricity consumption values are for Holcim El Salvador in calendar year 2021. These values were direct reported from Holcim records. The unit process "market for electricity, medium voltage/electricity, medium voltage/EC/kWh" was used to represent the El Salvador grid electricity used by the concrete plant.

**Process/space heating:** Not applicable.

**Fuel required for machinery:** Machinery-related fuel requirements were determined from direct Holcim information. The types of machinery used include generators and transportation equipment used for moving materials.

**Waste generation:** Waste generation values are directly reported from Holcim operations for both bulk waste. No Hazardous waste High-level radioactive waste is generated on-site at this facility.

**Recovered energy:** Not applicable.

**Recycled/reused material/components:** The amount of returned concrete is based on Holcim primary data for the reference year, 2021.



**Module A1 material losses:** Due to lack of data, default loss factors of 5% were assumed. The PCR states "A3 shall include an assumption of 5% material loss unless product specific data is available and transparently reported in the project LCA report underlying the EPD;"

**Direct A3 emissions accounting:** Not applicable.

**Waste transport requirements:** Transportation distances are using estimated values. The waste hauler cannot guarantee the exact distances traveled due to the variation of route and actual location of disposal. Most waste disposal sites are near the plant therefore the 25 km distance is a representative estimate. Returned concrete and wash water, measured in kilograms, is based on direct Holcim reporting for the reference year 2021.

**Product transport requirements:** The diesel fuel used by the mixing trucks is direct primary information reported from Holcim El Salvador records for the year 2021. Holcim records their fuel for their trucks in L/km and therefore the information was converted with the following formula: (Ave. km to site)\* 2 for return L diesel/km / (ave. m<sup>3</sup> of concrete in a load) total concrete volume in m<sup>3</sup> \* fraction allocated to A3. A4 is outside the scope of this study.

The following tables depict a list of assumed life cycle inventory utilized in the LCA modeling to generate the impact results across the life cycle modules in scope. An assessment of the quality of each LCI activities utilized from various sources is also provided.

Table 9: **LCI inputs assumed for module A1 (i.e. raw material supply)** Data Quality Assessment Key Fair=1, Good=2, Very Good=3.

Input	LCI.activity	Data.source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Water	tap water production, conventional with biological treatment/tap water/RoW/kg	ecoinvent v3.8	NA	v3.8 in 2021	2	3	1	3	3
Additives	market for chemical, organic/chemical, organic/GLO/kg	ecoinvent v3.8	Santa Tecla	v3.8 in 2021	2	3	1	3	3
Cemento Fuerte industrial	Cemento Fuerte Industrial	Program Operator: Labeling Sustainability- EPD ID: ae8c3b6d-1972-4402-b184-115794c37a67	Santa Ana	21 July 2023	3	3	3	3	3
River sand 1	sand quarry operation, extraction from river bed/sand/BR/kg; Note: modifications made (see	ecoinvent v3.8	La Libertad	v3.8 in 2021	2	3	1	3	3



	ecoinvent activity changes table)								
<b>Gravel</b>	gravel production, crushed/gravel, crushed/BR/kg; Note: modifications made (see ecoinvent activity changes table)	ecoinvent v3.8	La Libertad	v3.8 in 2021	2	3	1	3	3
<b>Fiber</b>	market for polypropylene, granulate/polypropylene, granulate/GLO/kg	Program Operator: Labeling Sustainability- EPD ID: e717da92-6eee-4fdb-b7d3-acfac1d3df01	San Salvador	29 November 2022	2	3	1	3	3

## DATA QUALITY ASSESSMENT

Data quality/variability requirements, as specified in the PCR, are applied. This section describes the achieved data quality relative to the ISO 14044:2006 requirements. Data quality is judged based on its precision (measured, calculated, or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied within a study serving as a data source) and representativeness (geographical, temporal, and technological).

**Precision:** Through measurement and calculation, the manufacturers collected and provided primary data on their annual production. For accuracy, the LCA practitioner and 3rd Party Verifier validated the plant gate-to-gate data.

**Completeness:** All relevant specific processes, including inputs (raw materials, energy, and ancillary materials) and outputs (emissions and production volume) were considered and modeled to represent the specified and declared products. The majority of relevant background materials and processes were taken from ecoinvent v3.8 LCI datasets where relatively recent region-specific electricity inputs were utilized. The most relevant EPDs requiring key A1 inputs were also utilized where readily available.

**Consistency:** To ensure consistency, the same modeling structure across the respective product systems was utilized for all inputs, which consisted of raw material inputs and ancillary material, energy flows, water resource inputs, product, and co-products outputs, returned and recovered Cement materials, emissions to air, water and soil, and waste recycling and treatment. The same background LCI datasets from the ecoinvent v3.8 database were used across all product systems. Crosschecks concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the plant and selected process level to maintain a high level of consistency.

**Reproducibility:** Internal reproducibility is possible since the data and the models are stored and available in a machine readable project file for all foreground and background processes, and in Labeling Sustainability's proprietary Ready Mix Concrete LCA calculator\* for all production facility and product-specific calculations. A considerable level of transparency is provided throughout the detailed



LCA report as the specifications and material quantity make-up for the declared products are presented and key primary and secondary LCI data sources are summarized. The provision of more detailed publicly accessible data to allow full external reproducibility was not possible due to reasons of confidentiality.

\*Labeling Sustainability has developed a proprietary tool that allows the calculation of PCR-compliant LCA results for Ready Mix Concrete product designs. The tool auto-calculates results by scaling base-unit technosphere inputs (i.e. 1 kg sand, 1 kWh electricity, etc.) to replicate the reference flow conversions that take place in any typical LCA software like openLCA or SimaPro. The tool was tested against several LCAs performed in openLCA and the tool generated identical results to those realized in openLCA across every impact category and inventory metric (where comparisons could be readily made).

**Representativeness:** The representativeness of the data is summarized as follows.

- Time related coverage of the manufacturing processes primary collected data from 2021-01-01 to 2021-12-31.
- Upstream (background) LCI data was either the PCR specified default (if applicable) or more appropriate LCI datasets as found in the country-adjusted ecoinvent v3.8 database.
- Geographical coverage for inputs required by the A3 facility(ies) is representative of its region of focus; other upstream and background processes are based on US, North American, or global average data and adjusted to regional electricity mixes when relevant.
- Technological coverage is typical or average and specific to the participating facilities for all primary data.

## ENVIRONMENTAL INDICATORS AND INVENTORY METRICS —

Per the PCR, this EPD supports the life cycle impact assessment indicators and inventory metrics as listed in the tables below. As specified in the PCR, the most recent US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), impact categories were utilized as they provide a North American context for the mandatory category indicators to be included in the EPD. Additionally, the PCR requires a set of inventory metrics to be reported with the LCIA indicators.

It should be noted that emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in any of the following categories.

## LIMITATIONS —

This EPD is a declaration of potential environmental impact and does not support or provide definitive comparisons of the environmental performance of specific products. Only EPDs prepared from cradle-to-grave life cycle results and based on the same function and reference service life and quantified by the same functional unit can be used to assist purchasers and users in making informed comparisons between products.



LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. Further, LCA offers a wide array of environmental impact indicators, and this EPD reports a collection of those, as specified by the PCR.

In addition to the impact results, this EPD provides several metrics related to resource consumption and waste generation. While these data may be informational in other ways, they do not provide a measure of impact on the environment.

## TOTAL IMPACT SUMMARY

The following table reports the total LCA results for each product produced at the given ready mix concrete facility on a per 1m<sup>3</sup> of concrete basis.

### Mix designs: 0 to 15 MPa

Table 10: Total life cycle (across modules in scope) impact results for Mix designs: 0 to 15MPa, assuming the geometric mean point values on a per 1 m<sup>3</sup> of concrete basis.

a) Midpoint Impact Categories:

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H+-Eq	kg N	kg CO <sub>2</sub> -Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
<b>Minimum</b>	71.9	0.13	380	4.42e-05	0.953	0.00244	5860
<b>Maximum</b>	81.7	0.146	430	4.94e-05	1.08	0.0028	6710
<b>Mean</b>	76.6	0.138	403	4.66e-05	1.01	0.00261	6250
<b>Median</b>	75.5	0.136	396	4.6e-05	1	0.00255	6100
<b>100 BOMBA ECOPACT</b>	71.9	0.13	380	4.42e-05	0.953	0.00244	5860
<b>100 BOMBA CON TEMPERATURA ECOPACT</b>	71.9	0.13	380	4.42e-05	0.953	0.00244	5860
<b>100 BOMBA CON RETARDANTE ECOPACT</b>	72.1	0.13	380	4.42e-05	0.955	0.00245	5880
<b>100 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT</b>	72.1	0.13	380	4.42e-05	0.955	0.00245	5880
<b>100 BOMBA CON FIBRA ECOPACT</b>	74.2	0.134	393	4.55e-05	0.982	0.00253	6060
<b>100 BOMBA CON FIBRA Y RETARDANTE ECOPACT</b>	74.3	0.134	394	4.56e-05	0.984	0.00254	6080
<b>100 BOMBA CON FRIBRA Y TEMPERATURA ECOPACT</b>	74.2	0.134	393	4.55e-05	0.982	0.00253	6060



<b>100 DIRECTO ECOPACT</b>	72.9	0.131	381	4.44e-05	0.969	0.00245	5880
<b>100 DIRECTO CON TEMPERATURA ECOPACT</b>	72.9	0.131	381	4.44e-05	0.969	0.00245	5880
<b>100 DIRECTO CON RETARDANTE ECOPACT</b>	75.5	0.136	395	4.6e-05	1	0.00255	6110
<b>100 DIRECTO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	75.5	0.136	395	4.6e-05	1	0.00255	6110
<b>100 DIRECTO CON FIBRA ECOPACT</b>	75.5	0.136	396	4.6e-05	1	0.00255	6100
<b>100 DIRECTO CON FIBRA Y RETARDANTE ECOPACT</b>	75.7	0.136	396	4.6e-05	1	0.00256	6120
<b>100 DIRECTO CON FRIBRA Y TEMPERATURA ECOPACT</b>	75.5	0.136	396	4.6e-05	1	0.00255	6100
<b>140 DIRECTO ECOPACT</b>	81	0.145	428	4.9e-05	1.07	0.00278	6670
<b>140 DIRECTO CON RETARDANTE ECOPACT</b>	81.1	0.145	428	4.9e-05	1.07	0.00279	6680
<b>140 DIRECTO CON TEMPERATURA ECOPACT</b>	81	0.145	428	4.9e-05	1.07	0.00278	6670
<b>140 DIRECTO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	81.1	0.145	428	4.9e-05	1.07	0.00279	6680
<b>140 BOMBA ECOPACT</b>	81.7	0.146	430	4.94e-05	1.08	0.0028	6700
<b>140 BOMBA CON RETARDANTE ECOPACT</b>	81.7	0.146	430	4.94e-05	1.08	0.0028	6710
<b>140 BOMBA CON TEMPERATURA ECOPACT</b>	81.7	0.146	430	4.94e-05	1.08	0.0028	6700
<b>140 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT</b>	81.7	0.146	430	4.94e-05	1.08	0.0028	6710



## b) Inventory Metrics:

Indicator/LC I Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWWC	CH W	CNH W
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
<b>Minimum</b>	6540	195	6330	167	0.00321	10.6	68.2	0.0057	0.178	0.000189	0	5.03
<b>Maximum</b>	7490	224	7270	192	0.00376	12	73.9	0.00629	0.189	0.000189	0	5.03
<b>Mean</b>	6970	209	6760	179	0.00344	11.5	70.9	0.00598	0.185	0.000189	0	5.03
<b>Median</b>	6800	204	6600	175	0.00336	11.8	70.8	0.00594	0.184	0.000189	0	5.03
<b>100 BOMBA ECOPACT</b>	6540	196	6330	167	0.00325	12	68.2	0.0057	0.184	0.000189	0	5.03
<b>100 BOMBA CON TEMPERATURA ECOPACT</b>	6540	195	6340	167	0.00324	12	68.2	0.0057	0.184	0.000189	0	5.03
<b>100 BOMBA CON RETARDANTE ECOPACT</b>	6590	195	6360	168	0.00321	12	68.2	0.0057	0.184	0.000189	0	5.03
<b>100 BOMBA CON RETARDANTE E Y TEMPERATURA ECOPACT</b>	6570	196	6340	168	0.00326	12	68.2	0.0057	0.184	0.000189	0	5.03
<b>100 BOMBA CON FIBRA ECOPACT</b>	6760	203	6560	173	0.00332	12	69.4	0.00584	0.189	0.000189	0	5.03
<b>100 BOMBA CON FIBRA Y RETARDANTE ECOPACT</b>	6790	204	6570	174	0.00331	12	69.5	0.00585	0.189	0.000189	0	5.03
<b>100 BOMBA CON FRIBRA Y TEMPERATURA ECOPACT</b>	6760	202	6540	174	0.00328	12	69.4	0.00584	0.189	0.000189	0	5.03
<b>100 DIRECTO ECOPACT</b>	6550	198	6380	168	0.00323	11.4	68.8	0.00574	0.178	0.000189	0	5.03
<b>100 DIRECTO CON TEMPERATURA ECOPACT</b>	6590	198	6360	168	0.00327	11.4	68.8	0.00574	0.178	0.000189	0	5.03
<b>100 DIRECTO CON</b>	6820	206	6610	175	0.00335	11.8	70.8	0.00594	0.178	0.000189	0	5.03



<b>RETARDANT E ECOPACT</b>												
<b>100 DIRECTO CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	681 0	20 4	661 0	175	0.0033 9	11.8	70.8	0.0059 4	0.178	0.0001 89	0	5.03
<b>100 DIRECTO CON FIBRA ECOPACT</b>	680 0	20 4	660 0	175	0.0033	11.9	70.8	0.0059 4	0.189	0.0001 89	0	5.03
<b>100 DIRECTO CON FIBRA Y RETARDANT E ECOPACT</b>	681 0	20 4	664 0	175	0.0034 2	11.8	70.9	0.0059 4	0.184	0.0001 89	0	5.03
<b>100 DIRECTO CON FRIBRA Y TEMPERATU RA ECOPACT</b>	680 0	20 6	659 0	174	0.0033 7	11.9	70.8	0.0059 4	0.189	0.0001 89	0	5.03
<b>140 DIRECTO ECOPACT</b>	744 0	22 2	724 0	190	0.0036 3	10.6	72.8	0.0062 1	0.184	0.0001 89	0	5.03
<b>140 DIRECTO CON RETARDANT E ECOPACT</b>	743 0	221	722 0	191	0.0036 8	10.6	72.8	0.0062 1	0.184	0.0001 89	0	5.03
<b>140 DIRECTO CON TEMPERATU RA ECOPACT</b>	742 0	221	721 0	190	0.0036 5	10.6	72.8	0.0062 1	0.184	0.0001 89	0	5.03
<b>140 DIRECTO CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	744 0	22 2	723 0	191	0.0036 4	10.6	72.8	0.0062 1	0.184	0.0001 89	0	5.03
<b>140 BOMBA ECOPACT</b>	746 0	22 3	727 0	191	0.0037 2	10.9	73.9	0.0062 8	0.189	0.0001 89	0	5.03
<b>140 BOMBA CON RETARDANT E ECOPACT</b>	749 0	22 3	727 0	192	0.0037 5	10.9	73.9	0.0062 9	0.189	0.0001 89	0	5.03
<b>140 BOMBA CON TEMPERATU RA ECOPACT</b>	747 0	22 4	724 0	191	0.0035 9	10.9	73.9	0.0062 8	0.189	0.0001 89	0	5.03
<b>140 BOMBA CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	748 0	22 3	726 0	192	0.0037 6	10.9	73.9	0.0062 9	0.189	0.0001 89	0	5.03



## Mix designs: 15 to 20 MPa

Table 11: Total life cycle (across modules in scope) impact results for Mix designs: 15 to 20MPa, assuming the geometric mean point values on a per 1 m<sup>3</sup> of concrete basis.

a) Midpoint Impact Categories:

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H+-Eq	kg N	kg CO <sub>2</sub> -Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
<b>Minimum</b>	85.4	0.152	452	5.18e-05	1.12	0.00295	7070
<b>Maximum</b>	88.5	0.157	466	5.33e-05	1.16	0.00305	7290
<b>Mean</b>	86.9	0.155	459	5.26e-05	1.14	0.003	7170
<b>Median</b>	87.4	0.155	460	5.26e-05	1.15	0.003	7190
<b>18o BOMBA ECOPACT</b>	85.5	0.153	453	5.2e-05	1.12	0.00295	7070
<b>18o BOMBA CON TEMPERATURA ECOPACT</b>	85.5	0.153	453	5.2e-05	1.12	0.00295	7070
<b>18o BOMBA CON RETARDANTE ECOPACT</b>	85.6	0.153	453	5.19e-05	1.12	0.00296	7080
<b>18o BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT</b>	85.4	0.152	452	5.18e-05	1.12	0.00295	7080
<b>18o BOMBA CON FIBRA ECOPACT</b>	87.5	0.156	465	5.3e-05	1.15	0.00303	7250
<b>18o BOMBA CON FIBRA Y RETARDANTE ECOPACT</b>	87.7	0.156	465	5.31e-05	1.15	0.00304	7270
<b>18o BOMBA CON FRIBRA Y TEMPERATURA ECOPACT</b>	87.5	0.156	465	5.3e-05	1.15	0.00303	7250
<b>18o DIRECTO ECOPACT</b>	86.2	0.154	453	5.2e-05	1.14	0.00296	7070
<b>18o DIRECTO CON TEMPERATURA ECOPACT</b>	86.2	0.154	453	5.2e-05	1.14	0.00296	7070
<b>18o DIRECTO CON RETARDANTE ECOPACT</b>	87.4	0.155	460	5.26e-05	1.15	0.003	7190
<b>18o DIRECTO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	87.4	0.155	460	5.26e-05	1.15	0.003	7190
<b>18o DIRECTO CON FIBRA ECOPACT</b>	88.3	0.157	466	5.32e-05	1.16	0.00304	7260



<b>180 DIRECTO CON FIBRA Y RETARDANTE ECOPACT</b>	88.5	0.157	466	5.33e-05	1.16	0.00305	7290
<b>180 DIRECTO CON FRIBRA Y TEMPERATURA ECOPACT</b>	88.3	0.157	466	5.32e-05	1.16	0.00304	7260

## b) Inventory Metrics:

Indicator/LC I Metric	TPE	RE	NR E	NR R	RR	WD P	LFW	LFHW	CBW C	CWWC	CH W	CNH W
Unit	MJ- Eq	MJ- Eq	MJ- Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
<b>Minimum</b>	788 0	231	763 0	201	0.0038 3	10.3	76.9	0.0065 6	0.178	0.0001 89	0	5.03
<b>Maximum</b>	813 0	24 3	789 0	208	0.0039 8	11	78.7	0.0067 4	0.189	0.0001 89	0	5.03
<b>Mean</b>	801 0	23 7	776 0	205	0.0039 1	10.6	77.9	0.0066 6	0.184	0.0001 89	0	5.03
<b>Median</b>	802 0	23 8	778 0	205	0.0039 2	10.5	78	0.0066 7	0.184	0.0001 89	0	5.03
<b>180 BOMBA ECOPACT</b>	790 0	23 3	765 0	202	0.0038 8	11	77.5	0.0066	0.184	0.0001 89	0	5.03
<b>180 BOMBA CON TEMPERATU RA ECOPACT</b>	788 0	23 2	763 0	201	0.0038 3	11	77.5	0.0066	0.184	0.0001 89	0	5.03
<b>180 BOMBA CON RETARDANT E ECOPACT</b>	792 0	23 4	769 0	202	0.0038 4	10.8	77.2	0.0065 9	0.184	0.0001 89	0	5.03
<b>180 BOMBA CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	790 0	231	764 0	203	0.0038 3	10.6	76.9	0.0065 6	0.184	0.0001 89	0	5.03
<b>180 BOMBA CON FIBRA ECOPACT</b>	810 0	24 0	784 0	207	0.0039 7	10.7	78.1	0.0067	0.189	0.0001 89	0	5.03
<b>180 BOMBA CON FIBRA Y RETARDANT E ECOPACT</b>	813 0	23 9	786 0	208	0.0039 6	10.7	78.2	0.0067 1	0.189	0.0001 89	0	5.03
<b>180 BOMBA CON FRIBRA Y TEMPERATU RA ECOPACT</b>	811 0	23 9	783 0	207	0.0039 2	10.7	78.1	0.0067	0.189	0.0001 89	0	5.03



<b>18o DIRECTO ECOPACT</b>	789 0	23 6	764 0	202	0.0038 8	10.4	77.7	0.0066 1	0.178	0.0001 89	0	5.03
<b>18o DIRECTO CON TEMPERATURA ECOPACT</b>	788 0	23 4	763 0	202	0.0038 7	10.4	77.7	0.0066 1	0.178	0.0001 89	0	5.03
<b>18o DIRECTO CON RETARDANTE ECOPACT</b>	801 0	23 7	777 0	205	0.0039 6	10.3	78	0.0066 7	0.178	0.0001 89	0	5.03
<b>18o DIRECTO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	802 0	23 8	779 0	205	0.0039 7	10.3	78	0.0066 7	0.178	0.0001 89	0	5.03
<b>18o DIRECTO CON FIBRA ECOPACT</b>	811 0	24 3	789 0	207	0.0039 8	10.3	78.6	0.0067 3	0.189	0.0001 89	0	5.03
<b>18o DIRECTO CON FIBRA Y RETARDANTE ECOPACT</b>	813 0	241	788 0	208	0.0039 7	10.3	78.7	0.0067 4	0.189	0.0001 89	0	5.03
<b>18o DIRECTO CON FRIBRA Y TEMPERATURA ECOPACT</b>	813 0	24 0	789 0	207	0.0039 3	10.3	78.6	0.0067 3	0.189	0.0001 89	0	5.03

### Mix designs: 21 to 25 MPa

Table 12: Total life cycle (across modules in scope) impact results for Mix designs: 21 to 25MPa, assuming the geometric mean point values on a per 1 m<sup>3</sup> of concrete basis.

a) Midpoint Impact Categories:

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H <sup>+</sup> -Eq	kg N	kg CO <sub>2</sub> -Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
<b>Minimum</b>	95.2	0.169	510	5.74e-05	1.25	0.00333	7960
<b>Maximum</b>	130	0.225	681	7.38e-05	1.7	0.00449	10600
<b>Mean</b>	103	0.182	554	6.18e-05	1.34	0.00362	8660
<b>Median</b>	102	0.18	548	6.14e-05	1.33	0.00359	8580
<b>21o DIRECTO ECOPACT</b>	99.1	0.175	525	5.92e-05	1.3	0.00343	8170
<b>21o DIRECTO CON TEMPERATURA ECOPACT</b>	99.1	0.175	525	5.92e-05	1.3	0.00343	8170

<b>210 DIRECTO CON RETARDANTE ECOPACT</b>	99.2	0.175	526	5.92e-05	1.3	0.00343	8190
<b>210 DIRECTO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	99.2	0.175	526	5.92e-05	1.3	0.00343	8190
<b>210 DIRECTO CON FIBRA ECOPACT</b>	101	0.179	538	6.03e-05	1.33	0.00351	8360
<b>210 DIRECTO CON FIBRA Y RETARDANTE ECOPACT</b>	101	0.179	538	6.04e-05	1.33	0.00352	8380
<b>210 DIRECTO CON FRIBRA Y TEMPERATURA ECOPACT</b>	101	0.179	538	6.03e-05	1.33	0.00351	8360
<b>210 BOMBA ECOPACT</b>	96.2	0.17	512	5.76e-05	1.26	0.00335	8000
<b>210 BOMBA CON TEMPERATURA ECOPACT</b>	96.2	0.17	512	5.76e-05	1.26	0.00335	8000
<b>210 BOMBA CON RETARDANTE ECOPACT</b>	96.2	0.171	515	5.82e-05	1.26	0.00337	8070
<b>210 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT</b>	96.2	0.171	515	5.82e-05	1.26	0.00337	8070
<b>210 BOMBA CON FIBRA ECOPACT</b>	98.5	0.174	525	5.89e-05	1.29	0.00344	8200
<b>210 BOMBA CON FIBRA Y RETARDANTE ECOPACT</b>	98.5	0.175	528	5.95e-05	1.29	0.00346	8270
<b>210 BOMBA CON FRIBRA Y TEMPERATURA ECOPACT</b>	98.5	0.174	525	5.89e-05	1.29	0.00344	8200
<b>210 BOMBA PP ECOPACT</b>	95.2	0.169	510	5.74e-05	1.25	0.00333	7960
<b>210 BOMBA PP CON TEMPERATURA ECOPACT</b>	95.2	0.169	510	5.74e-05	1.25	0.00333	7960
<b>210 SEMIFLUIDO ECOPACT</b>	101	0.18	545	6.11e-05	1.32	0.00357	8530
<b>210 SEMIFLUIDO CON TEMPERATURA ECOPACT</b>	101	0.18	545	6.11e-05	1.32	0.00357	8530
<b>210 SEMIFLUIDO CON RETARDANTE ECOPACT</b>	102	0.18	546	6.12e-05	1.33	0.00358	8560



<b>210 SEMIFLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	102	0.18	546	6.12e-05	1.33	0.00358	8560
<b>210 SEMIFLUIDO CON FIBRA ECOPACT</b>	102	0.18	547	6.13e-05	1.33	0.00358	8550
<b>210 SEMIFLUIDO CON FIBRA Y RETARDANTE ECOPACT</b>	102	0.181	548	6.14e-05	1.33	0.00359	8580
<b>210 SEMIFLUIDO CON FRIBRA Y TEMPERATURA ECOPACT</b>	102	0.18	547	6.13e-05	1.33	0.00358	8550
<b>210 SEMIFLUIDO 3/8 ECOPACT</b>	106	0.188	582	6.43e-05	1.37	0.00381	9130
<b>210 SEMIFLUIDO 3/8 CON RETARDANTE ECOPACT</b>	107	0.19	589	6.5e-05	1.38	0.00386	9250
<b>210 SEMIFLUIDO 3/8 CON TEMPERATURA ECOPACT</b>	106	0.188	582	6.43e-05	1.37	0.00381	9130
<b>210 SEMIFLUIDO 3/8 CON RETARDANTE Y TEMPERATURA ECOPACT</b>	107	0.19	589	6.5e-05	1.38	0.00386	9250
<b>210 FLUIDO ECOPACT</b>	102	0.18	552	6.18e-05	1.32	0.00361	8650
<b>210 FLUIDO CON TEMPERATURA ECOPACT</b>	102	0.18	552	6.18e-05	1.32	0.00361	8650
<b>210 FLUIDO CON RETARDANTE ECOPACT</b>	102	0.181	553	6.19e-05	1.32	0.00362	8680
<b>210 FLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	102	0.181	553	6.19e-05	1.32	0.00362	8680
<b>210 FLUIDO CON FIBRA ECOPACT</b>	103	0.182	559	6.24e-05	1.34	0.00366	8760
<b>210 FLUIDO CON FIBRA Y RETARDANTE ECOPACT</b>	103	0.182	559	6.25e-05	1.34	0.00367	8770
<b>210 FLUIDO CON FRIBRA Y TEMPERATURA ECOPACT</b>	103	0.182	559	6.25e-05	1.34	0.00367	8770
<b>210 FLUIDO 3/8 ECOPACT</b>	109	0.193	601	6.61e-05	1.41	0.00393	9410



<b>210 FLUIDO 3/8 CON RETARDANTE ECOPACT</b>	109	0.193	601	6.62e-05	1.41	0.00394	9430
<b>210 FLUIDO 3/8 CON TEMPERATURA ECOPACT</b>	109	0.193	601	6.61e-05	1.41	0.00393	9410
<b>210 FLUIDO 3/8 CON RETARDANTE Y TEMPERATURA ECOPACT</b>	109	0.193	601	6.62e-05	1.41	0.00394	9430
<b>210 LANZADO ECOPACT</b>	108	0.192	601	6.6e-05	1.4	0.00392	9380
<b>210 LANZADO CON TEMPERATURA ECOPACT</b>	108	0.192	601	6.6e-05	1.4	0.00392	9380
<b>210 PERMEABLE ECOPACT</b>	130	0.225	681	7.38e-05	1.7	0.00449	10600
<b>245 DIRECTO ECOPACT</b>	104	0.183	551	6.17e-05	1.36	0.00361	8600
<b>245 BOMBA ECOPACT</b>	104	0.183	556	6.21e-05	1.36	0.00364	8690
<b>250 DIRECTO ECOPACT</b>	104	0.183	551	6.17e-05	1.36	0.00361	8600
<b>250 BOMBA ECOPACT</b>	104	0.183	556	6.21e-05	1.36	0.00364	8690

## b) Inventory Metrics:

Indicator/L CI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWWC	CH W	CNH W
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
<b>Minimum</b>	8870	262	8610	227	0.00426	1.01	80.6	0.00709	0.105	0.000189	0	5.03
<b>Maximum</b>	11800	359	11500	303	0.00584	12.6	94.6	0.00875	0.205	0.000189	0	5.03
<b>Mean</b>	9670	285	9380	247	0.00469	10.2	84.7	0.00756	0.189	0.000189	0	5.03
<b>Median</b>	9560	282	9300	245	0.00466	9.92	84.9	0.00756	0.189	0.000189	0	5.03
<b>210 DIRECTO ECOPACT</b>	9110	273	8830	234	0.00451	9.14	83.9	0.00735	0.178	0.000189	0	5.03
<b>210 DIRECTO CON TEMPERATURA ECOPACT</b>	9140	273	8840	233	0.00445	9.14	83.9	0.00735	0.178	0.000189	0	5.03
<b>210 DIRECTO</b>	9140	272	8870	234	0.00447	9.14	84	0.00735	0.178	0.000189	0	5.03



<b>CON RETARDANTE ECOPACT</b>												
<b>210 DIRECTO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	9140	271	8910	234	0.00442	9.14	84	0.00735	0.178	0.000189	0	5.03
<b>210 DIRECTO CON FIBRA ECOPACT</b>	9340	278	9050	239	0.00452	8.95	84.7	0.00746	0.189	0.000189	0	5.03
<b>210 DIRECTO CON FIBRA Y RETARDANTE ECOPACT</b>	9390	278	9050	240	0.00462	8.96	84.8	0.00746	0.189	0.000189	0	5.03
<b>210 DIRECTO CON FIBRA Y TEMPERATURA ECOPACT</b>	9340	280	9060	239	0.00462	8.95	84.7	0.00746	0.189	0.000189	0	5.03
<b>210 BOMBA ECOPACT</b>	8930	265	8640	229	0.00431	9.81	81.2	0.00713	0.184	0.000189	0	5.03
<b>210 BOMBA CON TEMPERATURA ECOPACT</b>	8930	265	8660	228	0.00429	9.81	81.2	0.00713	0.184	0.000189	0	5.03
<b>210 BOMBA CON RETARDANTE ECOPACT</b>	8980	265	8730	230	0.00432	10.4	82.5	0.00722	0.189	0.000189	0	5.03
<b>210 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT</b>	9020	264	8730	230	0.00438	10.4	82.5	0.00722	0.189	0.000189	0	5.03
<b>210 BOMBA CON FIBRA ECOPACT</b>	9160	271	8860	234	0.00448	9.84	82.5	0.00728	0.189	0.000189	0	5.03
<b>210 BOMBA CON FIBRA Y</b>	9230	272	8950	237	0.00445	10.4	83.7	0.00736	0.189	0.000189	0	5.03



RETARDANT E ECOPACT												
<b>210 BOMBA CON FRIBRA Y TEMPERATU RA ECOPACT</b>	9140	26 9	8870	234	0.0043 3	9.84	82.5	0.0072 8	0.189	0.0001 89	0	5.03
<b>210 BOMBA PP ECOPACT</b>	8890	26 5	8610	227	0.0043 8	10.3	80.6	0.007 09	0.184	0.0001 89	0	5.03
<b>210 BOMBA PP CON TEMPERATU RA ECOPACT</b>	8870	26 2	8620	228	0.0042 6	10.3	80.6	0.007 09	0.184	0.0001 89	0	5.03
<b>210 SEMIFLUIDO ECOPACT</b>	9530	28 0	9240	244	0.0045 9	9.9	84.8	0.0075 1	0.189	0.0001 89	0	5.03
<b>210 SEMIFLUIDO CON TEMPERATU RA ECOPACT</b>	9520	27 9	9230	244	0.0046 2	9.9	84.8	0.0075 1	0.189	0.0001 89	0	5.03
<b>210 SEMIFLUIDO CON RETARDANT E ECOPACT</b>	9560	28 2	9260	244	0.0046 3	9.91	84.9	0.0075 2	0.189	0.0001 89	0	5.03
<b>210 SEMIFLUIDO CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	9540	28 2	9280	245	0.0046 2	9.91	84.9	0.0075 2	0.189	0.0001 89	0	5.03
<b>210 SEMIFLUIDO CON FIBRA ECOPACT</b>	9560	28 2	9310	245	0.0046 6	9.92	85.3	0.0075 5	0.2	0.0001 89	0	5.03
<b>210 SEMIFLUIDO CON FIBRA Y RETARDANT E ECOPACT</b>	9560	28 2	9260	245	0.0046 6	9.92	85.4	0.0075 6	0.2	0.0001 89	0	5.03
<b>210 SEMIFLUIDO CON FRIBRA Y TEMPERATU</b>	9550	28 4	9260	245	0.0046 9	9.92	85.3	0.0075 5	0.2	0.0001 89	0	5.03



RA ECOPACT												
<b>210 SEMIFLUIDO 3/8 ECOPACT</b>	1020 0	29 6	9860	261	0.0049 2	11.6	84.5	0.0077 2	0.2	0.0001 89	0	5.03
<b>210 SEMIFLUIDO 3/8 CON RETARDANT E ECOPACT</b>	1030 0	30 1	1000 0	264	0.0049 6	11.6	85.2	0.0078	0.2	0.0001 89	0	5.03
<b>210 SEMIFLUIDO 3/8 CON TEMPERATU RA ECOPACT</b>	1020 0	29 8	9870	260	0.0049 4	11.6	84.5	0.0077 2	0.2	0.0001 89	0	5.03
<b>210 SEMIFLUIDO 3/8 CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	1030 0	30 0	1000 0	264	0.0049 7	11.6	85.2	0.0078	0.2	0.0001 89	0	5.03
<b>210 FLUIDO ECOPACT</b>	9660	28 2	9350	247	0.0046 4	11.4	85	0.0075 7	0.194	0.0001 89	0	5.03
<b>210 FLUIDO CON TEMPERATU RA ECOPACT</b>	9650	28 3	9360	246	0.0047 3	11.4	85	0.0075 7	0.194	0.0001 89	0	5.03
<b>210 FLUIDO CON RETARDANT E ECOPACT</b>	9660	28 1	9420	248	0.0046 3	11.4	85.1	0.0075 8	0.194	0.0001 89	0	5.03
<b>210 FLUIDO CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	9690	28 2	9380	248	0.0046 6	11.4	85.1	0.0075 8	0.194	0.0001 89	0	5.03
<b>210 FLUIDO CON FIBRA ECOPACT</b>	9730	28 7	9480	251	0.0047 1	11.4	85.7	0.0076 5	0.194	0.0001 89	0	5.03
<b>210 FLUIDO CON FIBRA Y RETARDANT E ECOPACT</b>	9780	28 6	9530	250	0.0047 7	11.3	85.5	0.0076 4	0.194	0.0001 89	0	5.03



<b>210 FLUIDO CON FRIBRA Y TEMPERATURA ECOPACT</b>	9810	286	9540	250	0.00474	11.3	85.5	0.00764	0.194	0.000189	0	5.03
<b>210 FLUIDO 3/8 ECOPACT</b>	10500	305	10200	269	0.00497	11.7	86.1	0.00791	0.205	0.000189	0	5.03
<b>210 FLUIDO 3/8 CON RETARDANTE ECOPACT</b>	10500	306	10200	270	0.00508	11.7	86.2	0.00792	0.205	0.000189	0	5.03
<b>210 FLUIDO 3/8 CON TEMPERATURA ECOPACT</b>	10500	306	10200	269	0.00508	11.7	86.1	0.00791	0.205	0.000189	0	5.03
<b>210 FLUIDO 3/8 CON RETARDANTE Y TEMPERATURA ECOPACT</b>	10600	305	10200	270	0.00499	11.7	86.2	0.00792	0.205	0.000189	0	5.03
<b>210 LANZADO ECOPACT</b>	10500	306	10200	268	0.00503	12.6	84.7	0.00785	0.184	0.000189	0	5.03
<b>210 LANZADO CON TEMPERATURA ECOPACT</b>	10500	306	10200	268	0.00505	12.6	84.7	0.00785	0.184	0.000189	0	5.03
<b>210 PERMEABLE ECOPACT</b>	11800	359	11500	303	0.00584	1.01	94.6	0.00875	0.105	0.000189	0	5.03
<b>245 DIRECTO ECOPACT</b>	9610	286	9310	246	0.0047	8.37	85.9	0.0076	0.184	0.000189	0	5.03
<b>245 BOMBA ECOPACT</b>	9710	287	9400	248	0.00468	9.32	85.6	0.00762	0.189	0.000189	0	5.03
<b>250 DIRECTO ECOPACT</b>	9590	284	9300	245	0.00476	8.37	85.9	0.0076	0.184	0.000189	0	5.03
<b>250 BOMBA ECOPACT</b>	9680	284	9390	248	0.00478	9.32	85.6	0.00762	0.189	0.000189	0	5.03



## Mix designs: 26 to 30 MPa

Table 13: Total life cycle (across modules in scope) impact results for Mix designs: 26 to 30MPa, assuming the geometric mean point values on a per 1 m<sup>3</sup> of concrete basis.

a) Midpoint Impact Categories:

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H+-Eq	kg N	kg CO <sub>2</sub> -Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
<b>Minimum</b>	111	0.194	590	6.51e-05	1.45	0.00387	9200
<b>Maximum</b>	135	0.235	731	7.93e-05	1.75	0.00482	11500
<b>Mean</b>	119	0.209	644	7.08e-05	1.54	0.00423	10100
<b>Median</b>	116	0.205	634	6.99e-05	1.51	0.00416	9920
<b>28o DIRECTO ECOPACT</b>	111	0.194	590	6.51e-05	1.45	0.00387	9200
<b>28o DIRECTO CON TEMPERATURA ECOPACT</b>	111	0.194	590	6.51e-05	1.45	0.00387	9200
<b>28o DIRECTO CON RETARDANTE ECOPACT</b>	111	0.194	590	6.51e-05	1.45	0.00387	9200
<b>28o DIRECTO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	111	0.194	590	6.51e-05	1.45	0.00387	9200
<b>28o DIRECTO CON FIBRA ECOPACT</b>	112	0.196	597	6.58e-05	1.47	0.00391	9300
<b>28o DIRECTO CON FIBRA Y RETARDANTE ECOPACT</b>	112	0.196	597	6.58e-05	1.47	0.00392	9310
<b>28o DIRECTO CON FRIBRA Y TEMPERATURA ECOPACT</b>	112	0.196	597	6.58e-05	1.47	0.00391	9300
<b>28o BOMBA ECOPACT</b>	115	0.202	619	6.82e-05	1.5	0.00407	9690
<b>28o BOMBA CON TEMPERATURA ECOPACT</b>	115	0.202	619	6.82e-05	1.5	0.00407	9690
<b>28o BOMBA CON RETARDANTE ECOPACT</b>	115	0.202	619	6.82e-05	1.5	0.00407	9700
<b>28o BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT</b>	115	0.202	619	6.82e-05	1.5	0.00407	9700
<b>28o BOMBA CON FIBRA ECOPACT</b>	116	0.204	626	6.89e-05	1.51	0.00412	9800



<b>28o BOMBA CON FIBRA Y RETARDANTE ECOPACT</b>	116	0.204	626	6.88e-05	1.51	0.00412	9800
<b>28o BOMBA CON FRIBRA Y TEMPERATURA ECOPACT</b>	116	0.204	626	6.89e-05	1.51	0.00412	9800
<b>28o BOMBA PP ECOPACT</b>	114	0.201	618	6.82e-05	1.49	0.00406	9680
<b>28o BOMBA PP CON TEMPERATURA ECOPACT</b>	114	0.201	618	6.82e-05	1.49	0.00406	9680
<b>28o SEMIFLUIDO ECOPACT</b>	115	0.203	626	6.92e-05	1.49	0.00411	9810
<b>28o SEMIFLUIDO CON TEMPERATURA ECOPACT</b>	115	0.203	626	6.92e-05	1.49	0.00411	9810
<b>28o SEMIFLUIDO CON RETARDANTE ECOPACT</b>	115	0.203	627	6.92e-05	1.49	0.00412	9830
<b>28o SEMIFLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	115	0.203	627	6.92e-05	1.49	0.00412	9830
<b>28o SEMIFLUIDO CON FIBRA ECOPACT</b>	116	0.205	633	6.99e-05	1.51	0.00416	9910
<b>28o SEMIFLUIDO CON FIBRA Y RETARDANTE ECOPACT</b>	116	0.205	634	6.99e-05	1.51	0.00416	9930
<b>28o SEMIFLUIDO CON FRIBRA Y TEMPERATURA ECOPACT</b>	116	0.205	633	6.99e-05	1.51	0.00416	9910
<b>28o SEMIFLUIDO 3/8 ECOPACT</b>	121	0.213	661	7.23e-05	1.57	0.00434	10400
<b>28o SEMIFLUIDO 3/8 CON RETARDANTE ECOPACT</b>	122	0.215	668	7.3e-05	1.59	0.00439	10500
<b>28o SEMIFLUIDO 3/8 CON TEMPERATURA ECOPACT</b>	121	0.213	661	7.23e-05	1.57	0.00434	10400
<b>28o SEMIFLUIDO 3/8 CON RETARDANTE Y TEMPERATURA ECOPACT</b>	122	0.215	668	7.3e-05	1.59	0.00439	10500
<b>28o FLUIDO ECOPACT</b>	117	0.206	639	7.05e-05	1.51	0.0042	10000



<b>28o FLUIDO CON TEMPERATURA ECOPACT</b>	117	0.206	639	7.05e-05	1.51	0.0042	10000
<b>28o FLUIDO CON RETARDANTE ECOPACT</b>	118	0.208	646	7.12e-05	1.53	0.00424	10100
<b>28o FLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	118	0.208	646	7.12e-05	1.53	0.00424	10100
<b>28o FLUIDO CON FIBRA ECOPACT</b>	118	0.208	646	7.11e-05	1.53	0.00424	10100
<b>28o FLUIDO CON FIBRA Y RETARDANTE ECOPACT</b>	118	0.208	646	7.12e-05	1.53	0.00424	10100
<b>28o FLUIDO CON FRIBRA Y TEMPERATURA ECOPACT</b>	118	0.208	646	7.11e-05	1.53	0.00424	10100
<b>28o FLUIDO 3/8 ECOPACT</b>	125	0.22	685	7.47e-05	1.62	0.00451	10700
<b>28o FLUIDO 3/8 CON RETARDANTE ECOPACT</b>	125	0.22	686	7.48e-05	1.62	0.00451	10800
<b>28o FLUIDO 3/8 CON TEMPERATURA ECOPACT</b>	125	0.22	685	7.47e-05	1.62	0.00451	10700
<b>28o FLUIDO 3/8 CON RETARDANTE Y TEMPERATURA ECOPACT</b>	125	0.22	686	7.48e-05	1.62	0.00451	10800
<b>28o LANZADO ECOPACT</b>	123	0.218	688	7.54e-05	1.59	0.00448	10700
<b>28o LANZADO CON TEMPERATURA ECOPACT</b>	122	0.216	684	7.45e-05	1.58	0.00446	10700
<b>300 BOMBA ECOPACT</b>	135	0.235	730	7.93e-05	1.74	0.00481	11400
<b>300 BOMBA CON RETARDANTE ECOPACT</b>	135	0.235	731	7.93e-05	1.75	0.00482	11500
<b>300 BOMBA CON TEMPERATURA ECOPACT</b>	135	0.235	730	7.93e-05	1.74	0.00481	11400
<b>300 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT</b>	135	0.235	731	7.93e-05	1.75	0.00482	11500



## b) Inventory Metrics:

Indicator/L CI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWWC	CH W	CNH W
Unit	MJ- Eq	MJ- Eq	MJ- Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
<b>Minimum</b>	1020 0	30 5	9940	262	0.0049 7	7.2	86.9	0.0078 7	0.184	0.0001 89	0	5.03
<b>Maximum</b>	1280 0	37 7	1240 0	328	0.0062 9	13.1	99.4	0.0093 5	0.205	0.0001 89	0	5.03
<b>Mean</b>	1130 0	33 1	1090 0	288	0.0054 7	9.06	92.2	0.0084 7	0.198	0.0001 89	0	5.03
<b>Median</b>	1110 0	32 5	1080 0	284	0.0053 8	9.04	92.3	0.0084 2	0.2	0.0001 89	0	5.03
<b>280 DIRECTO ECOPACT</b>	1020 0	30 7	9970	262	0.005 01	7.65	86.9	0.0078 7	0.184	0.0001 89	0	5.03
<b>280 DIRECTO CON TEMPERATU RA ECOPACT</b>	1030 0	30 6	9970	263	0.005 04	7.65	86.9	0.0078 7	0.184	0.0001 89	0	5.03
<b>280 DIRECTO CON RETARDANT E ECOPACT</b>	1030 0	30 8	9960	263	0.0049 7	7.65	86.9	0.0078 7	0.184	0.0001 89	0	5.03
<b>280 DIRECTO CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	1030 0	30 5	9940	263	0.005 05	7.65	86.9	0.0078 7	0.184	0.0001 89	0	5.03
<b>280 DIRECTO CON FIBRA ECOPACT</b>	1040 0	31 0	1010 0	267	0.0051 3	7.66	87.5	0.0079 4	0.189	0.0001 89	0	5.03
<b>280 DIRECTO CON FIBRA Y RETARDANT E ECOPACT</b>	1040 0	312	1010 0	266	0.005 08	7.66	87.5	0.0079 4	0.189	0.0001 89	0	5.03
<b>280 DIRECTO CON FRIBRA Y TEMPERATU</b>	1040 0	30 8	1010 0	266	0.005 09	7.66	87.5	0.0079 4	0.189	0.0001 89	0	5.03

RA ECOPACT												
<b>28o BOMBA ECOPACT</b>	1080 0	32 2	1050 0	277	0.0053 3	8.21	90.2	0.0082 1	0.2	0.0001 89	0	5.03
<b>28o BOMBA CON TEMPERATU RA ECOPACT</b>	1080 0	31 9	1050 0	277	0.0052 6	8.21	90.2	0.0082 1	0.2	0.0001 89	0	5.03
<b>28o BOMBA CON RETARDANT E ECOPACT</b>	1090 0	32 4	1050 0	277	0.0053	8.21	90	0.0082	0.194	0.0001 89	0	5.03
<b>28o BOMBA CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	1080 0	32 0	1050 0	276	0.0052 9	8.21	90	0.0082	0.194	0.0001 89	0	5.03
<b>28o BOMBA CON FIBRA ECOPACT</b>	1090 0	32 4	1060 0	280	0.0052 7	8.22	90.8	0.0082 8	0.2	0.0001 89	0	5.03
<b>28o BOMBA CON FIBRA Y RETARDANT E ECOPACT</b>	1100 0	32 6	1060 0	281	0.0053 2	8.22	90.6	0.0082 8	0.2	0.0001 89	0	5.03
<b>28o BOMBA CON FRIBRA Y TEMPERATU RA ECOPACT</b>	1100 0	32 4	1060 0	280	0.0053 4	8.22	90.8	0.0082 8	0.2	0.0001 89	0	5.03
<b>28o BOMBA PP ECOPACT</b>	1080 0	321	1050 0	277	0.0052 8	9.07	90.1	0.0082 1	0.2	0.0001 89	0	5.03
<b>28o BOMBA PP CON TEMPERATU RA ECOPACT</b>	1080 0	31 7	1050 0	277	0.0052 7	9.07	90.1	0.0082 1	0.2	0.0001 89	0	5.03
<b>28o SEMIFLUIDO ECOPACT</b>	1100 0	32 2	1060 0	280	0.0052 5	10	91.6	0.0083 4	0.2	0.0001 89	0	5.03
<b>28o SEMIFLUIDO CON TEMPERATU RA ECOPACT</b>	1100 0	32 2	1060 0	281	0.0053	10	91.6	0.0083 4	0.2	0.0001 89	0	5.03
<b>28o SEMIFLUIDO</b>	1100 0	321	1070 0	280	0.0053 5	10	91.7	0.0083 5	0.2	0.0001 89	0	5.03

<b>CON RETARDANT E ECOPACT</b>												
<b>280 SEMIFLUIDO CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	1100 0	31 9	1070 0	281	0.0052 9	10	91.7	0.0083 5	0.2	0.0001 89	0	5.03
<b>280 SEMIFLUIDO CON FIBRA ECOPACT</b>	1100 0	32 4	1070 0	284	0.0054 3	10	92.3	0.0084 1	0.205	0.0001 89	0	5.03
<b>280 SEMIFLUIDO CON FIBRA Y RETARDANT E ECOPACT</b>	1110 0	321	1080 0	284	0.0053 6	10	92.3	0.0084 2	0.205	0.0001 89	0	5.03
<b>280 SEMIFLUIDO CON FRIBRA Y TEMPERATU RA ECOPACT</b>	1110 0	32 5	1070 0	284	0.0053 8	10	92.3	0.0084 1	0.205	0.0001 89	0	5.03
<b>280 SEMIFLUIDO 3/8 ECOPACT</b>	1150 0	33 9	1120 0	296	0.0056 2	9.07	93	0.008 61	0.2	0.0001 89	0	5.03
<b>280 SEMIFLUIDO 3/8 CON RETARDANT E ECOPACT</b>	1170 0	34 3	1140 0	299	0.0055 6	9.08	93.6	0.008 69	0.2	0.0001 89	0	5.03
<b>280 SEMIFLUIDO 3/8 CON TEMPERATU RA ECOPACT</b>	1160 0	34 0	1120 0	295	0.0056	9.07	93	0.008 61	0.2	0.0001 89	0	5.03
<b>280 SEMIFLUIDO 3/8 CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	1170 0	34 1	1130 0	298	0.0056 7	9.08	93.6	0.008 69	0.2	0.0001 89	0	5.03



<b>28o FLUIDO ECOPACT</b>	1120 0	32 5	1090 0	286	0.0053 8	10.5	92.6	0.0084 7	0.2	0.0001 89	0	5.03
<b>28o FLUIDO CON TEMPERATU RA ECOPACT</b>	1120 0	32 5	1090 0	287	0.0053 8	10.5	92.6	0.0084 7	0.2	0.0001 89	0	5.03
<b>28o FLUIDO CON RETARDANT E ECOPACT</b>	1130 0	33 0	1100 0	290	0.0054 4	10.5	93.3	0.0085 5	0.2	0.0001 89	0	5.03
<b>28o FLUIDO CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	1130 0	32 9	1100 0	289	0.0054 7	10.5	93.3	0.0085 5	0.2	0.0001 89	0	5.03
<b>28o FLUIDO CON FIBRA ECOPACT</b>	1130 0	32 8	1100 0	289	0.0053 7	10.5	93.1	0.0085 3	0.205	0.0001 89	0	5.03
<b>28o FLUIDO CON FIBRA Y RETARDANT E ECOPACT</b>	1130 0	32 9	1100 0	290	0.0054 3	10.5	93.2	0.0085 4	0.205	0.0001 89	0	5.03
<b>28o FLUIDO CON FRIBRA Y TEMPERATU RA ECOPACT</b>	1130 0	33 2	1090 0	289	0.0054 5	10.5	93.1	0.0085 3	0.205	0.0001 89	0	5.03
<b>28o FLUIDO 3/8 ECOPACT</b>	1200 0	35 6	1160 0	307	0.0058 6	9.02	94.8	0.008 85	0.2	0.0001 89	0	5.03
<b>28o FLUIDO 3/8 CON RETARDANT E ECOPACT</b>	1200 0	35 1	1160 0	308	0.0058 3	9.02	94.8	0.008 85	0.2	0.0001 89	0	5.03
<b>28o FLUIDO 3/8 CON TEMPERATU RA ECOPACT</b>	1200 0	35 4	1170 0	306	0.0057 9	9.02	94.8	0.008 85	0.2	0.0001 89	0	5.03
<b>28o FLUIDO 3/8 CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	1200 0	35 2	1160 0	308	0.0058 3	9.02	94.8	0.008 85	0.2	0.0001 89	0	5.03



<b>280 LANZADO ECOPACT</b>	1200 0	34 7	1160 0	306	0.0057 8	13.1	95.6	0.0089 4	0.2	0.0001 89	0	5.03
<b>280 LANZADO CON TEMPERATURA ECOPACT</b>	1190 0	34 9	1160 0	305	0.0057 8	11.8	93.4	0.0087 8	0.2	0.0001 89	0	5.03
<b>300 BOMBA ECOPACT</b>	1280 0	37 6	1240 0	326	0.0061 9	7.2	99.4	0.0093 4	0.2	0.0001 89	0	5.03
<b>300 BOMBA CON RETARDANTE ECOPACT</b>	1280 0	37 7	1240 0	327	0.0062 9	7.2	99.4	0.0093 5	0.2	0.0001 89	0	5.03
<b>300 BOMBA CON TEMPERATURA ECOPACT</b>	1280 0	37 5	1240 0	327	0.0062 1	7.2	99.4	0.0093 4	0.2	0.0001 89	0	5.03
<b>300 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT</b>	1280 0	37 6	1240 0	328	0.0062 1	7.2	99.4	0.0093 5	0.2	0.0001 89	0	5.03

### Mix designs: 31 to 35 MPa

Table 14: Total life cycle (across modules in scope) impact results for Mix designs: 31 to 35MPa, assuming the geometric mean point values on a per 1 m<sup>3</sup> of concrete basis.

a) Midpoint Impact Categories:

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H+-Eq	kg N	kg CO <sub>2</sub> -Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
<b>Minimum</b>	131	0.229	713	7.76e-05	1.7	0.0047	11200
<b>Maximum</b>	139	0.242	758	8.21e-05	1.79	0.005	11900
<b>Mean</b>	136	0.236	738	8.02e-05	1.75	0.00487	11600
<b>Median</b>	136	0.238	744	8.08e-05	1.77	0.0049	11600
<b>350 BOMBA ECOPACT</b>	136	0.238	743	8.07e-05	1.77	0.00489	11600
<b>350 BOMBA CON RETARDANTE ECOPACT</b>	137	0.239	744	8.08e-05	1.77	0.00491	11700
<b>350 BOMBA CON TEMPERATURA ECOPACT</b>	136	0.238	743	8.07e-05	1.77	0.00489	11600



<b>350 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT</b>	137	0.239	744	8.08e-05	1.77	0.00491	11700
<b>350 SEMIFLUIDO ECOPACT</b>	131	0.229	713	7.76e-05	1.7	0.0047	11200
<b>350 SEMIFLUIDO CON RETARDANTE ECOPACT</b>	131	0.229	713	7.77e-05	1.7	0.0047	11200
<b>350 SEMIFLUIDO CON TEMPERATURA ECOPACT</b>	131	0.229	713	7.76e-05	1.7	0.0047	11200
<b>350 SEMIFLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	131	0.229	713	7.76e-05	1.7	0.0047	11200
<b>350 FLUIDO ECOPACT</b>	139	0.242	757	8.21e-05	1.79	0.00499	11900
<b>350 FLUIDO CON RETARDANTE ECOPACT</b>	139	0.242	758	8.21e-05	1.79	0.005	11900
<b>350 FLUIDO CON TEMPERATURA ECOPACT</b>	139	0.242	757	8.21e-05	1.79	0.00499	11900
<b>350 FLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	139	0.242	758	8.21e-05	1.79	0.005	11900

## b) Inventory Metrics:

Indicator/L CI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWWC	CH W	CNH W
Unit	MJ- Eq	MJ- Eq	MJ- Eq	kg	m3	m3	kg wast e	kg waste	m3	m3	kg	kg
<b>Minimum</b>	1250 0	36 6	1210 0	319	0.006	7.73	98.1	0.0091 7	0.2	0.0001 89	0	5.03
<b>Maximum</b>	1330 0	39 1	1290 0	341	0.0064 1	7.91	102	0.009 65	0.205	0.0001 89	0	5.03
<b>Mean</b>	1290 0	37 9	1250 0	331	0.0062 2	7.81	100	0.0094 5	0.203	0.0001 89	0	5.03
<b>Median</b>	1300 0	38 2	1260 0	334	0.0062 4	7.84	101	0.0095	0.205	0.0001 89	0	5.03
<b>350 BOMBA ECOPACT</b>	1300 0	38 3	1260 0	334	0.0062 4	7.73	101	0.0095	0.2	0.0001 89	0	5.03
<b>350 BOMBA CON RETARDANT E ECOPACT</b>	1300 0	38 2	1260 0	335	0.0062 5	7.73	101	0.0095 1	0.2	0.0001 89	0	5.03
<b>350 BOMBA CON</b>	1300 0	38 1	1260 0	334	0.0062 3	7.73	101	0.0095	0.2	0.0001 89	0	5.03



TEMPERATURA ECOPACT												
<b>350 BOMBA CON RETARDANT E Y TEMPERATURA ECOPACT</b>	1300 0	38 2	1270 0	334	0.0062 4	7.73	101	0.0095 1	0.2	0.0001 89	0	5.03
<b>350 SEMIFLUIDO ECOPACT</b>	1250 0	36 8	1210 0	319	0.006 08	7.91	98.3	0.0091 9	0.205	0.0001 89	0	5.03
<b>350 SEMIFLUIDO CON RETARDANT E ECOPACT</b>	1250 0	36 6	1210 0	320	0.006	7.87	98.3	0.0091 9	0.205	0.0001 89	0	5.03
<b>350 SEMIFLUIDO CON TEMPERATURA ECOPACT</b>	1250 0	36 9	1210 0	319	0.0061 1	7.87	98.2	0.0091 8	0.205	0.0001 89	0	5.03
<b>350 SEMIFLUIDO CON RETARDANT E Y TEMPERATURA ECOPACT</b>	1250 0	36 7	1220 0	319	0.006 08	7.78	98.1	0.0091 7	0.205	0.0001 89	0	5.03
<b>350 FLUIDO ECOPACT</b>	1330 0	39 1	1290 0	340	0.0063 2	7.84	102	0.009 65	0.205	0.0001 89	0	5.03
<b>350 FLUIDO CON RETARDANT E ECOPACT</b>	1330 0	38 9	1290 0	341	0.0064 1	7.84	102	0.009 65	0.205	0.0001 89	0	5.03
<b>350 FLUIDO CON TEMPERATURA ECOPACT</b>	1330 0	38 8	1280 0	339	0.0063 7	7.84	102	0.009 65	0.205	0.0001 89	0	5.03
<b>350 FLUIDO CON RETARDANT E Y TEMPERATURA ECOPACT</b>	1330 0	38 7	1290 0	340	0.0063 5	7.84	102	0.009 65	0.205	0.0001 89	0	5.03

## Mix designs: 41 to 45 MPa

Table 15: Total life cycle (across modules in scope) impact results for Mix designs: 41 to 45MPa, assuming the geometric mean point values on a per 1 m<sup>3</sup> of concrete basis.

a) Midpoint Impact Categories:

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H+-Eq	kg N	kg CO <sub>2</sub> -Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
<b>Minimum</b>	130	0.228	707	7.71e-05	1.69	0.00466	11100
<b>Maximum</b>	133	0.233	727	7.9e-05	1.73	0.00479	11400
<b>Mean</b>	132	0.231	720	7.83e-05	1.72	0.00474	11300
<b>Median</b>	133	0.233	726	7.89e-05	1.73	0.00478	11400
<b>420 BOMBA ECOPACT</b>	130	0.228	707	7.71e-05	1.69	0.00466	11100
<b>420 BOMBA CON RETARDANTE ECOPACT</b>	130	0.228	708	7.72e-05	1.69	0.00466	11100
<b>420 BOMBA CON TEMPERATURA ECOPACT</b>	130	0.228	707	7.71e-05	1.69	0.00466	11100
<b>420 BOMBA CON RETARDANTE Y TEMPERATURA ECOPACT</b>	130	0.228	707	7.71e-05	1.69	0.00466	11100
<b>420 SEMIFLUIDO ECOPACT</b>	133	0.233	726	7.89e-05	1.73	0.00478	11400
<b>420 SEMIFLUIDO CON RETARDANTE ECOPACT</b>	133	0.233	726	7.9e-05	1.73	0.00479	11400
<b>420 SEMIFLUIDO CON TEMPERATURA ECOPACT</b>	133	0.233	726	7.89e-05	1.73	0.00478	11400
<b>420 SEMIFLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	133	0.233	726	7.9e-05	1.73	0.00479	11400
<b>420 FLUIDO ECOPACT</b>	133	0.233	726	7.89e-05	1.73	0.00478	11400
<b>420 FLUIDO CON RETARDANTE ECOPACT</b>	133	0.233	727	7.9e-05	1.73	0.00479	11400
<b>420 FLUIDO CON TEMPERATURA ECOPACT</b>	133	0.233	726	7.89e-05	1.73	0.00478	11400
<b>420 FLUIDO CON RETARDANTE Y TEMPERATURA ECOPACT</b>	133	0.233	727	7.9e-05	1.73	0.00479	11400



## b) Inventory Metrics:

Indicator/L CI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWW/C	CH W	CNH W
Unit	MJ- Eq	MJ- Eq	MJ- Eq	kg	m3	m3	kg wast e	kg waste	m3	m3	kg	kg
<b>Minimum</b>	1240 0	36 2	1200 0	316	0.0059 3	7.92	98.1	0.0091 4	0.2	0.0001 89	0	5.03
<b>Maximum</b>	1280 0	37 8	1240 0	327	0.0062 2	7.98	99.5	0.009 33	0.2	0.0001 89	0	5.03
<b>Mean</b>	1260 0	37 0	1220 0	323	0.006 09	7.94	99	0.009 27	0.2	0.0001 89	0	5.03
<b>Median</b>	1270 0	37 2	1230 0	325	0.0061 3	7.92	99.5	0.009 33	0.2	0.0001 89	0	5.03
<b>420 BOMBA ECOPACT</b>	1240 0	36 2	1200 0	317	0.0059 4	7.98	98.1	0.0091 5	0.2	0.0001 89	0	5.03
<b>420 BOMBA CON RETARDANT E ECOPACT</b>	1240 0	36 4	1200 0	317	0.0059 3	7.98	98.1	0.0091 5	0.2	0.0001 89	0	5.03
<b>420 BOMBA CON TEMPERATU RA ECOPACT</b>	1240 0	36 4	1200 0	316	0.006 03	7.98	98.1	0.0091 4	0.2	0.0001 89	0	5.03
<b>420 BOMBA CON RETARDANT E Y TEMPERATU RA ECOPACT</b>	1240 0	36 3	1200 0	317	0.0059 8	7.98	98.1	0.0091 4	0.2	0.0001 89	0	5.03
<b>420 SEMIFLUIDO ECOPACT</b>	1270 0	37 2	1230 0	325	0.0061 7	7.92	99.5	0.009 33	0.2	0.0001 89	0	5.03
<b>420 SEMIFLUIDO CON RETARDANT E ECOPACT</b>	1280 0	37 4	1240 0	326	0.0061 6	7.92	99.5	0.009 33	0.2	0.0001 89	0	5.03
<b>420 SEMIFLUIDO CON TEMPERATU RA ECOPACT</b>	1270 0	37 8	1240 0	326	0.006 07	7.92	99.5	0.009 33	0.2	0.0001 89	0	5.03
<b>420 SEMIFLUIDO CON RETARDANT E Y</b>	1280 0	37 2	1230 0	326	0.0062 2	7.92	99.5	0.009 33	0.2	0.0001 89	0	5.03



TEMPERATURA ECOPACT												
<b>420 FLUIDO ECOPACT</b>	1270 0	37 7	1240 0	325	0.0061 1	7.92	99.5	0.009 33	0.2	0.0001 89	0	5.03
<b>420 FLUIDO CON RETARDANT E ECOPACT</b>	1280 0	37 5	1230 0	327	0.0061 8	7.92	99.5	0.009 33	0.2	0.0001 89	0	5.03
<b>420 FLUIDO CON TEMPERATURA ECOPACT</b>	1270 0	37 2	1240 0	325	0.0061 5	7.92	99.5	0.009 33	0.2	0.0001 89	0	5.03
<b>420 FLUIDO CON RETARDANT E Y TEMPERATURA ECOPACT</b>	1270 0	371	1240 0	327	0.0061 8	7.92	99.5	0.009 33	0.2	0.0001 89	0	5.03

## ADDITIONAL ENVIRONMENTAL INFO

No regulated substances of very high concern are utilized on site.

## REFERENCES

### ASTM Standards:

- ASTM A36/A36M Standard Specification for Carbon Structural Steel
- ASTM A108 Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
- ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM A184 Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
- ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
- ASTM A416/A416M Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
- ASTM A555/A555M Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods
- ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

- ASTM A706/A706M Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
- ASTM A767/A767M Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
- ASTM A775/A775M Standard Specification for Epoxy-Coated Steel Reinforcing Bars
- ASTM A820/A820M Standard Specification for Steel Fibers for Fiber-Reinforced Concrete
- ASTM A884/A884M Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
- ASTM A934/A934M Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
- ASTM A1064/A1064M Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
- ASTM C33/C33M Standard Specification for Concrete Aggregates
- ASTM C94 Standard Specification for Ready-Mixed Concrete
- ASTM C150/C150M Standard Specification for Portland Cement
- ASTM C260/C260M Standard Specification for Air-Entraining Admixtures for Concrete
- ASTM C595 Standard Specification for Blended Hydraulic Cements
- ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- ASTM C979/C979M Standard Specification for Pigments for Integrally Colored Concrete
- ASTM C989/C989M Standard Specification for Slag Cement for Use in Concrete and Mortars
- ASTM C1017/C1017M Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
- ASTM C1116/C1116M Standard Specification for Fiber-Reinforced Concrete
- ASTM C1157/C1157M Standard Performance Specification for Hydraulic Cement
- ASTM C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures
- ASTM C1602/C1602M Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
- ASTM G109 Standard Test Method for Determining Effects of Chemical Admixtures on Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments
- ASTM C330/C330M Standard Specification for Lightweight Aggregates for Structural Concrete
- ASTM C494/C494M Standard Specification for Chemical Admixtures for Concrete

**CSA Standards:**

- CAN/CGSB-1.40 Anticorrosive Structural Steel Alkyd Primer
- CAN/CSA G30.18 Carbon steel bars for concrete reinforcement
- CAN/CSA A3000 Cementitious Materials Compendium
- CAN/CSA G40.20/G40.21 General requirements for rolled or welded structural quality steel / Structural quality steel
- CAN/CSA A23.1/A23.2 Concrete Materials and Methods of Concrete Construction/Test methods and Standard Practices for Concrete



- CAN/CSA A23.4 Precast concrete - Materials and construction
- CSA S806 Design and construction of building structures with fiber-reinforced polymers

### **ISO Standards:**

- ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms
- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)
- ISO 14025:2006 Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures
- ISO 14040:2006 Environmental Management - Life Cycle Assessment - Principles and Framework
- ISO 14044:2006 Environmental Management - Life Cycle Assessment - Requirements and Guidelines
- ISO 14067:2018 Greenhouse Gases - Carbon Footprint of Products - Requirements and Guidelines for Quantification
- ISO 14050:2009 Environmental Management - Vocabulary
- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products

### **EN Standards:**

- EN 16757 Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements.
- EN 15804 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

### **Other References:**

- US EPA Waste Reduction Model (WARM), Fly Ash Chapter: <http://epa.gov/climatechange/wycc/waste/downloads/fly-ash-chapter10-28-10.pdf>
- American Concrete Institute (ACI) 211: Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- ACI 318-14 Building Code Requirements for Structural Concrete and Commentary. American Concrete Institute. Farmington Hills, MI, USA available at <https://www.concrete.org/store/>
- Mather, B & Ozyildirim, C. (2002). SP-1(02) : Concrete Primer. American Concrete Institute: SP0102. American Concrete Institute. Farmington Hills, MI, USA available at <https://www.concrete.org/store/>
- NSF International (February 2019). Product Category Rules (PCR) for ISO 14025 Type III Environmental Product Declarations (EPDs) of Concrete v1.2.
- Product Category Rules for Preparing an Environmental Product Declaration for Precast Concrete (UN CPC 37550), ASTM International, March 2015. [https://www.astm.org/CERTIFICATION/DOCS/266.PCR\\_for\\_Precast\\_Concrete.pdf](https://www.astm.org/CERTIFICATION/DOCS/266.PCR_for_Precast_Concrete.pdf)



- USGBC LEED v4 for Building Design and Construction, 11 Jan 2019 available at <https://www.usgbc.org/resources/pcr-committee-process-resources-part-b>
- USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017 available at <https://www.usgbc.org/resources/pcr-committee-process-resources-part-b>.

