CROSS LAMINATED TIMBER (CLT)

Systems for Lightweight Solutions

KNAUF

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Content

INTRODUCTION

In recent years, the construction industry has been undergoing a remarkable transformation, with a shift towards sustainable and eco-friendly practices. One innovation that is gaining significant attention is Cross Laminated Timber (CLT) systems. This revolutionary building material is paving the way for a more sustainable and efficient construction future.

The next generation of massive timber building systems is transforming how buildings in Australia are designed and constructed. As the demand for sustainable and cost-effective building materials increases, developers, builders and architects have turned to CLT as a viable solution for low-medium rise buildings up to 25 metres in height.

GENERAL INFORMATION

What is Cross Laminated Timber (CLT)?

CLT is a cutting-edge engineered wood product that is revolutionising the way we build. It consists of multiple layers of timber planks stacked in alternating directions and bonded together with structural adhesives.

This unique composition ensures remarkable strength, stability, and durability. With its prefabricated nature, CLT enables faster construction, reducing project timelines significantly. CLT walls are structural elements and can be used in place of concrete walls, precast concrete walls, light framed timber stud walls and many other load bearing wall structures.

Sustainability at the Core

One of the key advantages of CLT is its exceptional sustainability. Timber is a natural and renewable resource and using timber as a primary building product ensures carbon sequestration. Carbon sequestration means that when a tree is harvested, the carbon it has sequestered during its natural lifecycle is retained within its cellular structure. Unlike traditional construction materials such as concrete and steel, CLT is harvested from sustainably managed forests. This process helps reduce the carbon footprint associated with construction projects.

Timber is the only major building material that is renewable, recyclable, and has a lower carbon footprint throughout its life cycle. By incorporating CLT into buildings, the carbon can be effectively locked away for the lifespan of the structure. This makes CLT an invaluable tool in the fight against climate change.

Knauf CLT Systems

Constantly innovating to deliver valued solutions to the Australian building industry, in conjunction with CLT manufacturer, XLAM, Knauf have developed building code-compliant Wall and Floor/Ceiling systems for multi-residential buildings but also suitable for other building segments.

Knauf CLT systems are lightweight solutions, incorporating familiar and already established plasterboard systems construction methodologies to suit a variety of applications and performance requirements such as but not limited to fire resistance, acoustics and wet areas.

Knauf CLT systems have been successfully used in a variety of projects throughout Australia, including the landmark Adelaide Oval Hotel, Monash University Frankston student accommodation, La Trobe University student accommodation and many others.

DESIGN CONSIDERATIONS

Fire Resistance

- Knauf CLT systems satisfy the requirements of the National Construction Code (NCC) for fire protected timber (Massive Timber) and suitable for buildings with an effective height of 25 metres in height.
- Knauf utilise 16 mm FireStop as a non-combustible fire-protective covering fixed to CLT walls on both sides to achieve FRL 120/120/120 from both directions.
- Knauf utilises 16 mm FireStop as a non-combustible fire-protective covering fixed to the underside of CLT floors to achieve FRL 120/120/120.
- Knauf CLT and XLAM systems are supported by fire tests at CSIRO laboratories at North Ryde in Sydney, and assessments by CSIRO, Warringtonfire and BRANZ.

Structural and Seismic

- CLT walls and floors are to be designed to relevant Australian Standards, NCC and project requirements. Refer to XLAM for design and details.
- Knauf CLT systems utilise Rondo steel components and are to be designed to relevant Australian Standards, NCC and project requirements. Refer to Rondo for design and details.

Acoustics

- Knauf CLT systems' acoustic ratings provided in this publication and other Knauf manuals are independently determined by PKA Acoustic Consulting.
- Knauf CLT systems utilises Knauf Insulation glasswool in the wall and ceiling cavities to achieve the stated acoustic ratings. It also satisfies NCC requirements for cavity filled non-combustible insulation.
- Knauf CLT inter-tenancy wall systems can satisfy the NCC requirement of $R_w + C_{tr}$ not less than 50, discontinuous construction and acoustic impact insulation.
- Knauf CLT corridor wall systems can satisfy the NCC requirement of R_w not less than 50.
- For other Knauf CLT system acoustic performances, refer to Systems+ and/or Knauf online tools.

Thermal

- Knauf CLT systems have been independently certified by James M Fricker P/L to achieve stated thermal performance in accordance with AS 4859:2018
- Knauf CLT systems provide Total R-value performance for various wall and floor/ceiling configurations to meet the requirements of the NCC
- Knauf CLT external walls achieve a Total R-value from $R_{t(sum)}$ R3.61 and $R_{t(win)}$ R3.71
- Knauf CLT floor/ceiling systems achieve a Total R-value from $R_{t(sum)}$ R2.63 and $R_{t(win)}$ R2.50
- Other Knauf CLT internal walls achieve a Total R-Value from R1.1 onwards

Design and BIM Details

- Knauf CLT systems have been incorporated in BIM Wizard Revit and ArchiCAD, which streamlines the process of selecting, designing and creating the correct specification for CLT wall and floor/ceiling systems
- Knauf CLT systems can also be easily selected and specified using Knauf eSelector
- Knauf CLT systems CAD details are available on our CAD Finder, knauf.com

Installation

For installation details refer to Knauf online CAD Finder or contact TecASSIST for information.

INTERNAL WALLS

Table 1: System CLTB120.1

Fire Resistance Level
FRL 120/120/120
From both sides

FRL Basis: FC17317-01

System Description
Side 1: Refer to table
CLT: Refer to table
Side 2: Refer to table

Acoustic Opinion: PKA103KNF — **Thermal Basis:** JMF REPORT 274F

System	Lining Side 1	Lining Side 2	Nom Wall Width mm	122-142	142-162	162-182	187-207
			CLT Thickness mm	90	110	130	155
			Insulation	$R_w(R_w+C_{tr})$			
CLTB120.1A	1 x 16 mm FireStop	1 x 16 mm FireStop	Nil	37(34)	38(35)	38(36)	40(37)
CLTB120.1B	1 x 16 mm MultiStop ONE	1 x 16 mm MultiStop ONE	Nil	37(34)	38(35)	38(36)	40(37)
CLTB120.1D	2 x 13 mm FireStop	2 x 13 mm FireStop	Nil	38(35)	39(36)	40(37)	41(38)
CLTB120.1E	2 x 13 mm MultiStop ONE	2 x 13 mm MultiStop ONE	Nil	39(36)	40(37)	40(37)	41(38)

Multistop ONE HI may be a substitute for Multistop ONE to achieve the above performance.
R-values of systems in the range of R1.1-R1.73. For specific R-values, refer to eSelector.

CORRIDOR WALLS

Table 2: System CLTB120.2

Fire Resistance Level
FRL 120/120/120
From both sides

FRL Basis: FC17317-01

System Description

CLT (Refer to table):
- 16 mm fire resistant plasterboard direct fix to both sides

Side 2:
- 1 x 13 mm or 2 x 13 mm or 1 x 16 mm pbd
- 45 mm cavity using 28 mm furring channel + Betafix clips
- Insulation (refer to table)

Acoustic Opinion: PKA103KNF — **Thermal Basis:** JMF REPORT 274F

System	Lining Direct Fix to Both Sides of CLT	Lining Side 2	Nom Wall Width mm	180-193	200-213	220-233	245-258
			CLT Thickness mm	90	110	130	155
			Insulation*	$R_w(R_w+C_{tr})$			
CLTB120.2A	1 x 16 mm FireStop	1 x 13 mm SHEETROCK ONE	Nil	39(34)	40(34)	40(35)	41(35)
			KI 50G11	51(42)	52(43)	52(44)	53(45)
CLTB120.2B	1 x 16 mm FireStop	1 x 13 mm WetStop	Nil	39(34)	40(34)	40(35)	41(35)
			KI 50G11	51(42)	52(43)	52(44)	53(45)
CLTB120.2C	1 x 16 mm FireStop	1 x 13 mm FireStop	Nil	40(35)	41(36)	41(36)	42(37)
			KI 50G11	51(43)	53(44)	54(45)	54(46)
CLTB120.2D	1 x 16 mm FireStop	1 x 13 mm ImpactStop	Nil	41(36)	42(36)	42(37)	43(37)
			KI 50G11	53(44)	54(45)	54(46)	55(47)
CLTB120.2E	1 x 16 mm FireStop	1 x 13 mm MultiStop ONE	Nil	41(36)	42(36)	42(37)	43(37)
			KI 50G11	53(44)	54(45)	54(46)	55(47)
CLTB120.2G	1 x 16 mm FireStop	1 x 16 mm FireStop	Nil	42(36)	42(37)	43(37)	43(38)
			KI 50G11	54(45)	54(46)	55(47)	56(47)
CLTB120.2H	1 x 16 mm FireStop	2 x 13 mm FireStop	Nil	44(39)	45(40)	45(40)	46(41)
			KI 50G11	57(48)	57(49)	58(50)	59(51)
CLTB120.2J	1 x 16 mm FireStop	2 x 13 mm ImpactStop	Nil	45(40)	45(40)	46(41)	46(41)
			KI 50G11	57(49)	58(50)	59(50)	59(51)

Multistop ONE HI may be a substitute for Multistop ONE to achieve the above performance.
* KI 50G11 - 50mm glasswool insulation 11 kg/m^3 density.
R-values of systems in the range of R2.13-R3.59. For specific R-values, refer to eSelector..

INTER-TENANCY WALLS

Table 3: System CLTB120.4

Fire Resistance Level
FRL 120/120/120
From both sides

FRL Basis: FC17317-01

System Description

CLT (Refer to table):
- 1 x 16 mm fire resistant pbd direct fix to both sides

Side 2:
- 1 x 13 mm or 2 x 13 mm or 1 x 16 mm pbd
- 64 mm Rondo steel studs
- 20 mm gap to steel frame
- Insulation (refer to table)

Acoustic Opinion: PKA103KNF — **Thermal Basis:** JMF REPORT 274F

System	Lining Direct Fix to Both Sides of CLT	Lining Side 2	Nom Wall Width mm	219-232	239-252	259-272	284-297
			CLT Thickness mm	90	110	130	155
			Insulation*	$R_w(R_w+C_{tr})$			
CLTB120.4A	1 x 16 mm FireStop	1 x 13 mm SHEETROCK ONE	Nil	50(41)	51(42)	52(43)	52(44)
			KI 75G11	57(47)	58(48)	59(49)	60(50)
CLTB120.4B	1 x 16 mm FireStop	1 x 13 mm WetStop	Nil	50(41)	51(42)	52(43)	52(44)
			KI 75G11	57(47)	58(48)	59(49)	60(50)
CLTB120.4C	1 x 16 mm FireStop	1 x 13 mm FireStop	Nil	51(43)	52(44)	52(44)	53(45)
			KI 75G11	58(48)	59(49)	59(50)	61(51)
CLTB120.4D	1 x 16 mm FireStop	1 x 13 mm ImpactStop	Nil	52(43)	52(44)	53(45)	54(46)
			KI 75G11	59(49)	59(50)	60(51)	61(52)
			KI 90G11	59(50)	-	-	-
CLTB120.4E	1 x 16 mm FireStop	1 x 13 mm MultiStop ONE	Nil	52(43)	52(44)	53(45)	54(46)
			KI 75G11	59(49)	59(50)	60(51)	61(52)
			KI 90G11	59(50)	-	-	-
CLTB120.4G	1 x 16 mm FireStop	1 x 16 mm FireStop	KI 75G11	59(50)	60(51)	60(51)	61(52)
CLTB120.4H	1 x 16 mm FireStop	2 x 13 mm SHEETROCK ONE	Nil	53(45)	54(46)	54(47)	55(48)
			KI 75G11	60(51)	60(52)	61(53)	62(54)
CLTB120.4I	1 x 16 mm FireStop	2 x 13 mm WetStop	Nil	53(45)	54(46)	54(47)	55(48)
			KI 75G11	60(51)	60(52)	61(53)	62(54)
CLTB120.4J	1 x 16 mm FireStop	2 x 13 mm FireStop	Nil	54(47)	54(48)	55(48)	56(49)
			KI 75G11	60(52)	61(53)	62(54)	63(55)
CLTB120.4L	1 x 16 mm FireStop	2 x 13 mm MultiStop ONE	Nil	54(47)	55(48)	55(49)	56(50)
			KI 75G11	60(53)	61(54)	62(55)	63(56)
CLTB120.4N	1 x 16 mm FireStop	12 x 13 mm ImpactStop	Nil	54(47)	55(48)	55(49)	56(50)
			KI 75G11	60(53)	61(54)	62(55)	63(56)

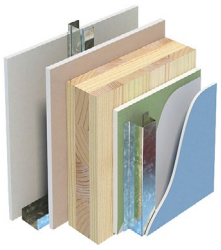
Multistop ONE HI may be a substitute for Multistop ONE to achieve the above performance.
* KI 50G11 - 50 mm glasswool insulation 11kg/m³ density.
KI 75G11 - 75 mm glasswool insulation 11kg/m³ density.
KI 90G11 - 90 mm glasswool insulation 11kg/m³ density.
R-values > R3.03 for all systems with insulation. For specific R-values, refer to eSelector.

EXTERNAL WALLS

Table 4: System CLTE120.1

Fire Resistance Level
FRL 120/120/120
From both sides

FRL Basis: FC17317-01



System Description

Side 1:
- 1 x 13 mm plasterboard
- 64 mm Rondo steel studs
- 25 mm gap to steel framing

Insulation:
- (refer to table)

CLT (Refer to table):
- 1 x 16 mm fire resistant pbd direct fix to internal face, 1 x 16 mm fire/water resistant pbd direct fix to external face

External:
- Nil insulation - Vapour Barrier Only
- 45 mm gap using Steel Top Hat

External Cladding:
- 9 mm fibre cement

Acoustic Opinion: PKA103KNF — **Thermal Basis:** JMF REPORT 274F

System	Lining Side 1	Lining Direct Fix to Both Sides of CLT†	Lining Direct Fix to External Side of CLT†	Nom Wall Width mm	278	298	318	343
				CLT Thickness mm	90	110	130	155
				Insulation*	$R_w(R_w+C_{tr})$			
CLTE120.1A	1 x 13 mm SHEETROCK ONE	1 x 16 mm FireStop	1 x 16 mm MultiStop ONE	KI 90G R2.5 (stud)	60(47)	61(48)	61(49)	62(50)
CLTE120.1B	1 x 13 mm WetStop	1 x 16 mm FireStop	1 x 16 mm MultiStop ONE	KI 90G R2.5 (stud)	60(47)	61(48)	61(49)	62(50)
CLTE120.1C	1 x 13 mm FireStop	1 x 16 mm FireStop	1 x 16 mm MultiStop ONE	KI 90G R2.5 (stud)	61(49)	62(50)	63(51)	63(52)
CLTE120.1E	1 x 13 mm MultiStop ONE	1 x 16 mm FireStop	1 x 16 mm MultiStop ONE	KI 90G R2.5 (stud)	62(50)	63(51)	63(52)	64(53)
CLTE120.1F	1 x 13 mm ImpactStop	1 x 16 mm FireStop	1 x 16 mm MultiStop ONE	KI 90G R2.5 (stud)	62(50)	63(51)	63(52)	64(53)

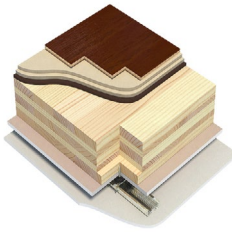
* KI 90G R2.5 - 50 mm glasswool insulation 11kg/m³ density.
† External side of CLT direct fix 1 x 16 mm MultiStop ONE.
R-values of systems in the range of R4.11-R5.41. For specific R-values, refer to eSelector.

FLOOR CEILING SYSTEM

Table 5: System CLTC120.12

Fire Resistance Level
FRL 120/120/120
From both sides

FRL Basis: FC17317-01



System Description

Floor Finish:
- Min 14 mm Engineered Timber or min 7 mm
- Laminate Flooring on min 3 mm Underlay

Floor Covering:
- 2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactmat

CLT:
- 1 x 16 mm fire resistant pbd direct fixed to underside of CLT

Insulation:
- Refer to table

Ceiling Fixing:
- 28 mm furring channel + Betafix Clip

Lining Side 2:
- 1 x 13 mm or 2 x 13 mm pbd

Acoustic Opinion: PKA103KNF — **Thermal Basis: JMF** REPORT 274F

System	Flooring Covering	Lining side 1	Ceiling Cavity mm	CLT Size mm	140	170	200
				Insulation*	$R_w (R_w+C_{tr})$ $L_{n,w}$	$R_w (R_w+C_{tr})$ $L_{n,w}$	$R_w (R_w+C_{tr})$ $L_{n,w}$
CLTC120.12A	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	1 x 13 mm SHEETROCK ONE	50	Nil	50(43) 68	52(44) 66	53(45) 65
				KI 50G11	56(46) 61	57(47) 59	58(48) 58
CLTC120.12B	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	1 x 13 mm WetStop	50	Nil	50(43) 68	52(44) 66	53(45) 65
				KI 50G11	56(46) 61	57(47) 59	58(48) 58
CLTC120.12C	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	1 x 13 mm FireStop	50	Nil	51(43) 66	52(45) 65	53(46) 63
				KI 50G11	56(47) 60	57(48) 58	58(49) 56
CLTC120.12D	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	1 x 13 mm ImpactStop	50	Nil	51(44) 66	52(45) 64	53(46) 63
				KI 50G11	56(47) 59	57(48) 57	58(49) 56
CLTC120.12E	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	1 x 13 mm MultiStop ONE	50	Nil	51(44) 66	52(45) 64	53(46) 63
				KI 50G11	56(47) 59	57(48) 57	58(49) 56
CLTC120.12F	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	2 x 13 mm SHEETROCK ONE	50	Nil	52(45) 64	53(46) 62	54(47) 61
				KI 50G11	57(48) 57	58(49) 55	59(51) 54
CLTC120.12G	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	2 x 13 mm FireStop	50	Nil	52(45) 62	53(46) 61	54(47) 59
				KI 50G11	57(49) 56	58(50) 54	59(51) 52
CLTC120.12H	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	2 x 13 mm MultiStop ONE	50	Nil	52(45) 62	53(46) 60	54(47) 59
				KI 50G11	57(49) 55	58(50) 53	59(52) 52

Multistop ONE HI may be a substitute for Multistop ONE to achieve the above performance.
* KI 50G11 - 50 mm glasswool insulation 11 kg/m³ density.
R-values of systems in the range of R2.13-R3.59. For specific R-values, refer to eSelector.

FLOOR CEILING SYSTEM CONT.

Table 6: System CLTC120.22

Fire Resistance Level
FRL 120/120/120
From both sides

FRL Basis: FC17317-01

System Description

Floor Finish:
Min 14 mm Engineered Timber or min 7 mm Laminate Flooring on min 3 mm Underlay

Floor Covering:
2 x 13 mm Fiberock on 10 mm Embelton Impactmat

CLT:
1 x 16 mm fire resistant pbd direct fixed to underside of CLT

Insulation:
Refer to table

Ceiling Fixing:
Rondo suspension system/ Betafix clip with 28 m furring channel

Lining Side 2:
1 x 13 mm or
2 x 13 mm pbd

Acoustic Opinion: PKA103KNF — **Thermal Basis: JMF** REPORT 274F

System	Flooring Covering	Lining Direct Fix To Side 1 of CLT	Lining side 1	Ceiling Cavity mm	CLT Size mm	140	170	200
					Insulation*	$R_w(R_w+C_{tr})$ $L_{n,w}$	$R_w(R_w+C_{tr})$ $L_{n,w}$	$R_w(R_w+C_{tr})$ $L_{n,w}$
CLTC120.22A	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	1 x 16 mm FireStop	1 x 13 mm SHEETROCK ONE	100	Nil	51(44) 61	53(45) 60	54(46) 58
					KI 90G11	57(49) 54	59(50) 52	60(51) 51
				150	Nil	52(45) 60	53(46) 59	54(47) 57
					KI 90G11	58(50) 53	59(51) 51	60(52) 50
				200	Nil	52(45) 60	53(46) 58	54(47) 57
					KI 90G11	58(51) 52	59(52)w 51	60(53) 49
CLTC120.22B	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	1 x 16 mm FireStop	1 x 13 mm WetStop	100	Nil	51(44) 61	53(45) 60	54(46) 58
					KI 90G11	57(49) 54	59(50) 52	60(51) 51
				150	Nil	52(45) 60	53(46) 59	54(47) 57
					KI 90G11	58(50) 53	59(51) 51	60(52) 50
				200	Nil	52(45) 60	53(46) 58	54(47) 57
					KI 90G11	58(51) 52	59(52) 51	60(53) 49
CLTC120.22C	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	1 x 16 mm FireStop	1 x 13 mm FireStop	100	Nil	52(45) 60	53(46) 58	54(47) 57
					KI 90G11	58(50) 53	59(51) 51	60(52) 50
				150	Nil	52(45) 59	54(47) 58	55(48) 56
					KI 90G11	58(51) 52	60(52) 50	61(53) 49
				200	Nil	53(46) 58	54(47) 57	55(48) 55
					KI 90G11	59(52) 51	60(53) 49	61(54) 48
CLTC120.22D	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	1 x 16 mm FireStop	1 x 13 mm ImpactStop	100	Nil	52(45) 59	54(46) 58	55(47) 56
					KI 90G11	58(50) 52	60(51) 50	61(53) 49
				150	Nil	53(46) 58	54(47) 57	55(48) 55
					KI 90G11	59(51) 51	60(53) 49	61(54) 48
				200	Nil	53(46) 58	54(47) 56	55(48) 55
					KI 90G11	59(52) 50	60(53) 49	61(54) 47
CLTC120.22E	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	1 x 16 mm FireStop	1 x 13 mm MultiStop ONE	100	Nil	52(45) 59	54(46) 58	55(47) 56
					KI 90G11	58(50) 52	60(51) 50	61(53) 49
				150	Nil	53(46) 58	54(47) 57	55(48) 55
					KI 90G11	59(51) 51	60(53) 49	61(54) 48
				200	Nil	53(46) 58	54(47) 56	55(48) 55
					KI 90G11	59(52) 50	60(53) 49	61(54) 47
CLTC120.22F	2 x 13 mm FIBEROCK Aqua-Tough on 10 mm Embelton Impactamat	1 x 16 mm FireStop	2 x 13 mm SHEETROCK ONE	100	Nil	54(46) 57	55(47) 56	56(48) 54
					KI 90G11	59(51) 50	61(53) 48	62(54) 47
				150	Nil	54(47) 56	55(48) 55	56(49) 53
					KI 90G11	60(53) 49	61(54) 47	62(55) 46
				200	Nil	54(47) 56	55(48) 54	56(49) 53
					KI 90G11	60(53) 48	61(54) 47	62(56) 45

Multistop ONE HI may be a substitute for Multistop ONE to achieve the above performance.
* KI 50G11 - 50 mm glasswool insulation 11 kg/m³ density.
R-values of systems in the range of R2.13-R3.59. For specific R-values, refer to eSelector.

Sales Enquiries

1800 003 377

To purchase Knauf plasterboard and other building materials including insulation, cornice, compounds, ceilings and accessories visit the Where To Buy page on our website for a list of Knauf Fulfilment Centres and distributors.

TecASSIST

1800 811 222

Our National TecASSIST helpline is available to answer technical questions and provide free advice to builders, contractors, architects, engineers and home owners throughout Australia.

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Find all of Knauf's technical literature in our comprehensive Download Centre. From CAD files to certifications, installation guides and data sheets - our most up to date product and system information is at your fingertips.

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