FLEXISPOT

Kana Bed Frame

White Paper

Built with Japanese joinery
Shaped by careful craftsmanship
Tested for everyday life



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FLEXISPOT

CONTENTS

Section 1 Brand Philosophy and Story----03
Section 2 Craftsmanship and Culture---- 04
Section 3 Purpose of Testing----07
Section 4 Summary of Tests----08
4.1 Structural Performance---- 09
4.2 Noise Performance---- 29
4.3 Transportation Reliability----34
4.4 Materials and Environmental Responsibility---- 37
4.5 User Experience----46
4.6 Product Safety---- 50
Section 5 Certification and Supporting Evidence----53

SECTION ONE

01 Brand Philosophy and Story

1.1 The Roots of Eastern Joinery

A Philosophy of Natural Materials and Lasting Connection

A bed should not feel disposable. Some contemporary furniture is designed primarily around fast production and flat-pack convenience. Kana takes a different approach, focusing on natural materials, thoughtful construction, and continued use over time. Our return to mortise-and-tenon joinery reflects a different point of view—one grounded in respect for natural materials and a preference for living with fewer, better-made things.

Wood naturally responds to changes in temperature and humidity. Conventional furniture construction often depends heavily on metal brackets, bolts, and rigid fastening systems. Mortise-and-tenon joinery uses fitted wooden components whose grain direction, geometry, and contact surfaces are considered as part of the connection design. In Kana, this approach is combined with metal hardware where it provides a clear functional advantage.

1.2 Reimagined for Japandi Living

Traditional Joinery for Modern Life

We bring this traditional construction method into a contemporary Japandi aesthetic, blending Japanese restraint with Scandinavian warmth. Unnecessary ornament is removed so that clean architectural lines and natural wood grain can define the design. The result is a bed frame with a calm, grounded presence—one intended to make the bedroom feel warmer, quieter, and more connected to nature.

This approach also brings traditional joinery into modern daily life. Reducing visible metal hardware preserves the visual continuity of the wood and gives the frame a more natural, cohesive appearance. Computer-controlled machining supports dimensional consistency at key connection points, helping make assembly, disassembly, and reassembly more straightforward. The frame is designed to be maintained, taken apart, and reassembled. Repeated-use evidence for the tested rubberwood configuration is presented later in this white paper. These features support continued use through moves and changes in the home, subject to proper assembly, care, and product condition.

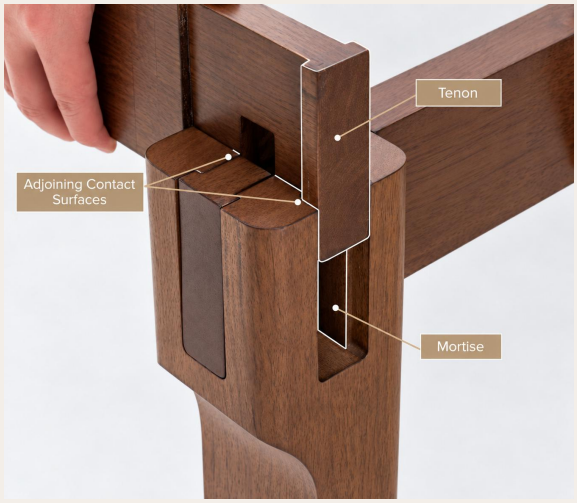
SECTION TWO

02 Craftsmanship and Culture

Chapter One introduced the philosophy behind Kana: a bed frame shaped by natural materials, thoughtful construction, and a commitment to long-term use. This chapter looks at how those ideas take form in the frame itself, from the logic of mortise-and-tenon joinery to the materials and processes used in its construction.

2.1 Mortise-and-Tenon Joinery

How the Connection Works



Kana Form A



Kana Form B

Mortise-and-tenon joinery connects two wooden components through a projecting section, known as the tenon, and a matching recess, known as the mortise. The adjoining surfaces fit closely together, allowing weight to be transferred across a broader area of wood rather than relying on a single screw to carry the load.

Kana uses mortise-and-tenon joinery as both the frame's primary structural language and a defining visual element. Metal hardware is added only where it provides a clear functional advantage. The intention is not to remove metal at any cost, but to use each connection method where it performs best.

2.2 Material Selection and Craftsmanship

Grain, Color, and the Feel of the Finish

Kana is designed as a consistent form that can be expressed through different woods. Its material palette has been explored through rubberwood, acacia, walnut veneer, beech, white oak, and solid walnut. Rubberwood offers a calm, balanced appearance, while acacia brings warmer tonal variation. Walnut veneer adds visual depth across broader surfaces. Beech contributes fine grain and a light, natural tone, giving the design a softer expression. White oak is valued for its density, hardness, and dimensional stability, creating a substantial material character. Solid walnut brings a richer, quieter appearance. Each material contributes its own character while preserving Kana's recognizable proportions, joinery, and restrained visual language.

These materials belong to a broader and continually developing design palette rather than a single fixed assortment. Some are represented in current Kana configurations, while others reflect the continuing development of the collection. The material combination, construction details, and availability of an individual product may therefore vary according to its configuration and release status.

Different parts of a bed serve different functions. Material selection is therefore considered in relation to the role of each component, its position within the frame, and the type of load it is intended to carry. Across Kana's different material expressions, the aim is to preserve the same underlying design and construction logic while allowing each wood to contribute its own visual and tactile character.

Natural wood will always vary in grain, color, and surface character. Good craftsmanship does not mean eliminating these differences. It means considering how visible boards and neighboring components work together, so that the finished frame feels balanced while retaining the character of real wood. Where boards are joined to form wider components, the direction of the grain and the transition between colors are considered as part of the finishing process. Edges in areas commonly handled during moving are gently rounded to reduce sharp contact points and make the frame more comfortable to handle, while preserving the clean, architectural lines of the design.

Computer-controlled machining supports consistency across key components, particularly at connection points where fit influences assembly. This contributes to a frame that can be assembled, taken apart, and reassembled in a straightforward manner.

Material availability varies by product configuration and release status. The applicable product listing should be used to confirm the material, construction, and finish of a specific model.

2.3 Responsible Use of Wood

Making the Most of Every Board

Trees absorb carbon dioxide as they grow, and a portion of that carbon remains stored in the wood for as long as the material stays in use. The environmental value of wood furniture therefore depends not only on the material itself, but also on responsible sourcing, efficient manufacturing, and the useful life of the finished product.

Cutting plans are designed to make better use of each board and reduce unnecessary waste. Suitable smaller pieces of wood can be used for smaller components or directed to other practical uses rather than discarded.

Durability is also part of responsible manufacturing. A bed that can be maintained, taken apart, and reassembled can remain usable when a household moves or a room changes. Extending the useful life of the frame allows the material and craftsmanship invested in it to remain valuable for longer.

2.4 Designed for a Steady Night's Sleep

From Everyday Movement to Structural Performance

A bed supports more than static weight. Two people may turn over at different times, sit on the edge together, or lean against the headboard. A child may climb onto the mattress, and a pet may jump on or off the bed. Each of these movements sends force through the frame in a different way.

The mattress-support system, side rails, legs, joints, and other supporting elements are arranged to distribute these forces across the frame. The goal is for the bed to feel steady and well supported during everyday movement, rather than relying on a single connection or component to carry the entire load.

These everyday situations also inform the performance evaluations presented later in this white paper. Whole-bed loading, edge loading, repeated movement, impact, joint strength, and noise are considered as separate aspects of frame performance, allowing structural behavior to be assessed through measurable observations rather than appearance alone. The tested configuration and applicable scope of each result are identified in the relevant test section.

SECTION THREE

03 Purpose of Testing

The purpose of Kana's testing is to connect technical evaluation with the way a bed is actually used. Rather than presenting isolated figures that may be difficult to interpret, this white paper explains the conditions behind each result and places quantitative measurements alongside documented observations and, where available, photographic evidence.

The evaluations begin with familiar use situations: two people sharing the bed, sitting at the edge, leaning against the headboard, turning over, getting into or out of bed, and occasional impact. They also consider repeated movement, moving-related handling, assembly and reassembly, dimensional consistency, mattress fit, surface condition, sound behavior, and the ability of the packaging to protect components during distribution.

The report is organized across structural performance, sound performance, packaging and transportation, materials and environmental performance, user experience, and product safety. Within these areas, the recorded evidence covers material identification, chemical emissions from a named tested configuration, finish adhesion and resistance, load-bearing stability, repeated-use durability, noise behavior, packaging performance, assembly and reassembly, dimensional consistency, mattress fit, and the condition of visible and customer-facing surfaces.

Each evaluation identifies, as applicable, the tested sample or product configuration, test conditions, method basis, acceptance criteria, key measurements, and recorded results. Published test methods are used as procedural or measurement references where applicable and should not be interpreted as a blanket product-certification claim.

Baseline Test Conditions, Additional Test Conditions, and Boundary/Destructive Conditions are presented separately. Baseline Test Conditions are assessed against the acceptance criteria stated for the relevant evaluation. Additional Test Conditions document performance under higher loads, more cycles, or other more demanding procedures and receive a pass/fail result only where a separate acceptance criterion is expressly stated. Boundary/Destructive Conditions document severe deformation or fracture and do not represent safe working loads, product ratings, or recommended conditions of use.

Any limitation, missing source value, or item requiring further verification is stated rather than inferred. The results apply to the identified samples, configurations, and test conditions and should not be treated as a guarantee of identical performance for every product, material expression, or possible use situation.

The purpose of this approach is to help customers understand what was tested, what was observed, and where the stated evidence ends. It also provides a documented basis for continuing design improvement, quality control, and future product validation.

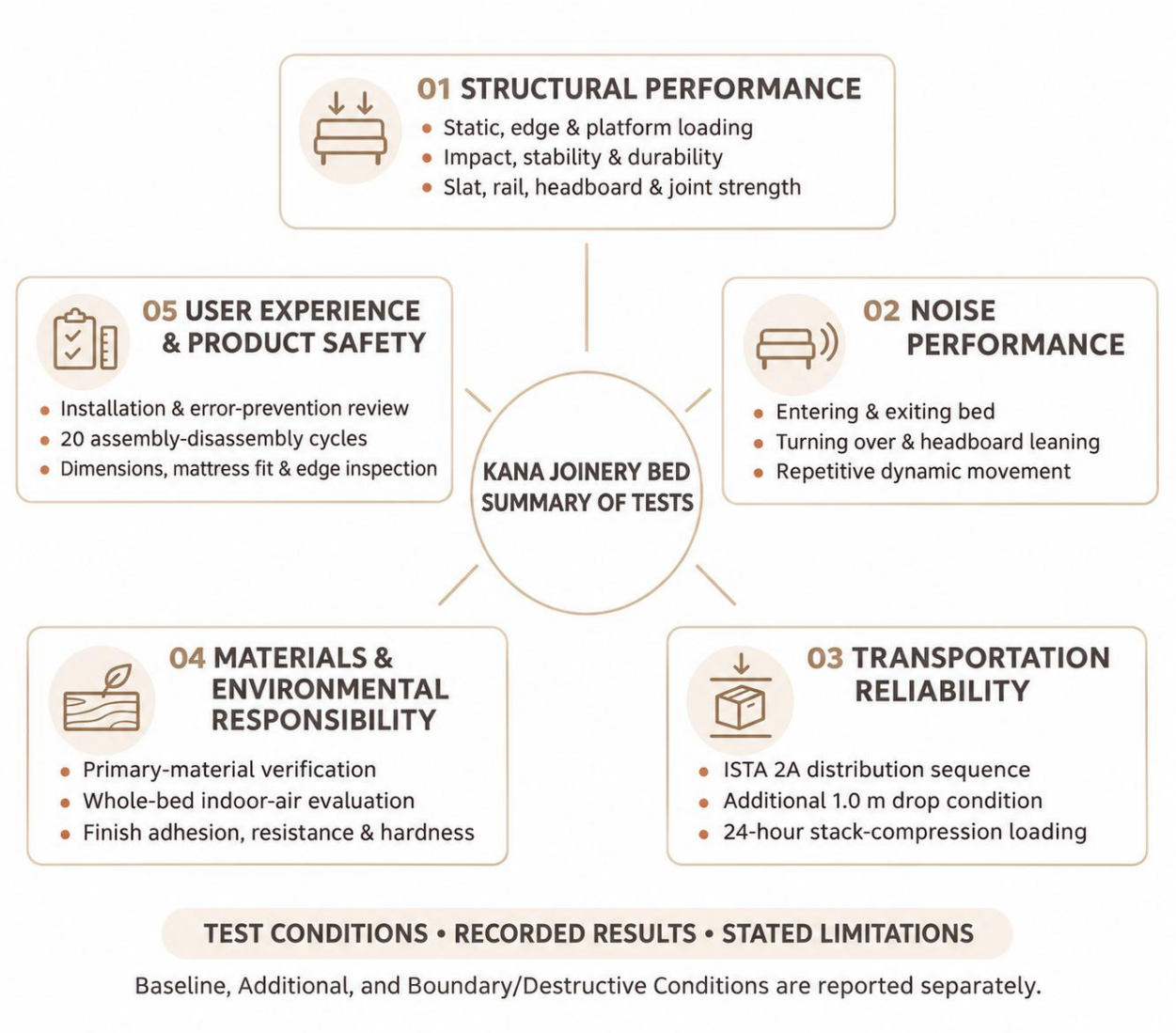
SECTION FOUR

04 Summary of Tests

Kana uses a cross-shaped mortise-and-tenon connection as a core structural element. This shared construction supports a range of visual forms and size configurations. To accommodate mattress dimensions, living spaces, and use preferences commonly found across different markets, each Kana configuration is developed to its applicable product dimensions. Kana is developed in two distinct design forms, Form A and Form B. While the two forms differ in their visual design, both incorporate the same cross-shaped mortise-and-tenon connection as their core structural element. The form, dimensions, materials, and configuration of a specific product should always be confirmed through the corresponding product listing, packaging information, and assembly instructions. The product-performance evaluations presented in this white paper are based on documented Kana samples incorporating the cross-shaped mortise-and-tenon construction. The tested samples represent the rubberwood Kana Form A configuration. The results provide a technical reference for the shared structural construction and should be interpreted in the context of the documented sample specifications, product configurations, and test procedures.

The evaluations are presented in the same sequence as the sections that follow. Structural Performance covers whole-bed distributed loading, mattress-platform and side-rail loading, anti-tip stability, vertical impact, repeated horizontal and vertical loading, headboard loading and durability, and the behavior of the mortise-and-tenon connections during moving and turning. Noise Performance examines the assembled bed during entering and exiting, turning over, leaning against the headboard, and repetitive dynamic movement. Transportation Reliability covers the ISTA 2A distribution sequence, the separately identified 1.0 m Additional Drop Condition, and 24-hour stack-compression loading. Materials and Environmental Responsibility includes primary-material verification, whole-bed indoor-air evaluation, and finish-performance evaluations covering cross-cut classification, artificial-perspiration resistance, alcohol exposure, and pencil hardness. User Experience and Product Safety cover installation guidance and error-prevention review, 20 assembly-and-disassembly cycles, product-dimension verification, mattress fit, visible-surface condition, and the customer-facing edges and boundaries of the assembled frame.

Each evaluation identifies, as applicable, the tested sample, test conditions, method basis, acceptance criteria, measurements, recorded results, and relevant limitations. Baseline Test Conditions are assessed against the acceptance criteria expressly stated for the relevant evaluation. Additional Test Conditions document performance under higher loads, more cycles, or other more demanding procedures and receive a pass/fail conclusion only where a separate acceptance criterion is expressly defined. Boundary/Destructive Conditions document severe deformation or fracture. They must not be interpreted as safe working loads, product ratings, recommended conditions of use, or evidence of performance beyond the documented Kana samples and the test procedures.



4.1 Structural Performance

Kana is evaluated as a complete structural system. The side rails, slats, center rail, legs, headboard, and mortise-and-tenon connections are tested under distributed loading, concentrated loading, impact, repeated movement, and repeated assembly-related handling.

The evaluations below distinguish between Baseline Test Conditions, Additional Test Conditions, and Boundary/Destructive Conditions. Baseline Test Conditions are assessed against the acceptance criteria stated for each evaluation. Additional Test Conditions apply higher loads, more cycles, or other more demanding procedures to observe performance beyond the baseline. An Additional Test Condition is assigned a pass/fail result only when a separate acceptance criterion is expressly stated. Boundary/Destructive Conditions document severe deformation or fracture and do not represent safe working loads, product ratings, or recommended conditions of use.

4.1.1 Whole-Bed Static Load and Structural Strength

TEST PURPOSE

To evaluate whether the bed frame, support system, and slats remain structurally stable under long-duration distributed loading from sleepers, a mattress, and everyday items.

TEST METHOD

Method Source: EN 1725:2023 and ISO 19833:2018 were used as procedural references. The loads, cycle counts, measurement points, and acceptance criteria stated below were selected for this evaluation.

The bed was assembled according to the instruction manual and fitted with an approximately 100 mm test mattress.

Baseline Test Condition: a uniformly distributed load of 700 kg for 24 hours.

Additional Test Conditions: uniformly distributed loads of 800 kg, 900 kg, 1,000 kg, and 1,100 kg.

Point A was located at the center of the side rail.

Point B was located at one-quarter of the bed width, at the center of the slat-support area.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied to this evaluation:

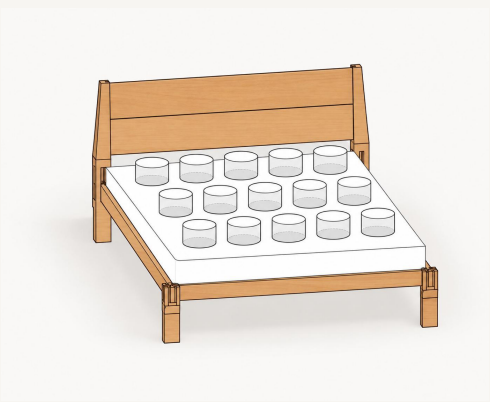
After the 700 kg Baseline Test Condition and a one-minute recovery period, deformation must not exceed 7 mm at Point A.

After the 700 kg Baseline Test Condition and a one-minute recovery period, deformation must not exceed 2.5 mm at Point B.

The 800–1,100 kg Additional Test Conditions document deformation and failure behavior only. No separate pass/fail criterion is assigned to these conditions.

TEST RESULTS

Uniformly distributed load	Unit	Point A (before / after)	Change A≤7	Point B (before / after)	Change B≤2.5	Recorded result
700 kg Baseline Test Condition	mm	358 / 360	2	331 / 331	0	Pass — met the stated acceptance criterion under the Baseline Test Condition
800 kg Additional Test Condition	mm	358 / 359	1	331 / 330	1	Observation only — no separate pass/fail criterion; no abnormality recorded
900 kg Additional Test Condition	mm	358 / 360	2	331 / 330	1	Observation only — no separate pass/fail criterion; no abnormality recorded
1,000 kg Additional Test Condition	mm	358 / 360	2	331 / 330	1	Observation only — no separate pass/fail criterion; no abnormality recorded
1,100 kg Additional Test Condition	mm	Center support rail fractured after 12 hours; observation only, with no pass/fail conclusion assigned				





4.1.2 Mattress-Platform Vertical Static Load and Support Stability

TEST PURPOSE

To evaluate the mattress platform under concentrated loading associated with sitting, standing, localized body weight, or use with a thinner mattress.

TEST METHOD

Method Source: EN 1725:2023 and ISO 19833:2018 were used as procedural references. The loads, cycle counts, measurement points, and acceptance criteria stated below were selected for this evaluation.

The bed was fitted with an approximately 100 mm test mattress.

Four potentially adverse loading positions, identified as Points A, B, C, and D, were selected.

Each point was positioned at least 100 mm from the edge of the mattress platform.

Baseline Test Condition: a vertical force of 1,500 N was applied 10 times at each point.

Each application was held for 10 ±1 seconds.

Additional Test Condition: the procedure was repeated with a vertical force of 2,000 N.

ACCEPTANCE CRITERIA

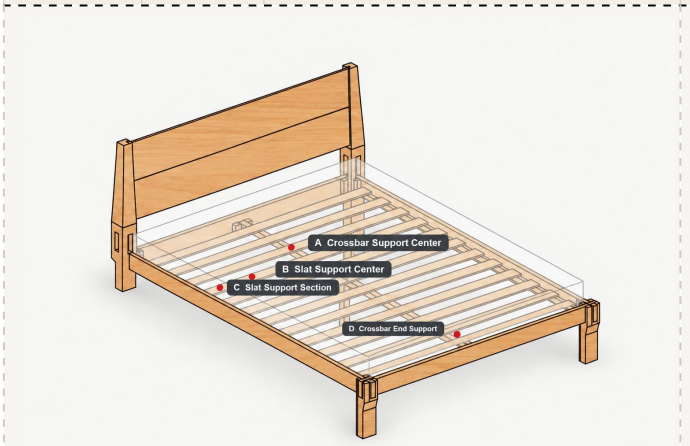
The following acceptance criteria were applied to this evaluation:

For rigid supporting components, deformation after the 1,500 N Baseline Test Condition and a one-minute recovery period must not exceed 3 mm.

The 2,000 N Additional Test Condition documents deformation and failure behavior only and has no separate pass/fail criterion.

TEST RESULTS

Applied load	Unit	Point A (before / after)	Point B (before / after)	Point C (before / after)	Point D (before / after)	Recorded result
1,500 N Baseline Test Condition	mm	327 / 326	329 / 324	329 / 328	313 / 312	Pass — no slat or supporting-component fracture or loss of intended function was recorded under the Baseline Test Condition.
2,000 N Additional Test Condition	mm	327 / 325	329 / 319	329 / 328	313 / 312	Observation only — no separate pass/fail criterion; no abnormality recorded





*The 3 mm deformation limit applies only to separately tested rigid supporting components. It is not the pass/fail criterion for single-point loading of the flexible slat platform. Because the slat platform is designed to flex under load, the deformation measurements are recorded for reference only. This evaluation is considered to pass when no slat or supporting component fractures or loses its intended function under the stated Baseline Test Condition.

4.1.3 Anti-Tip Stability

TEST PURPOSE

To evaluate whether the bed lifts or tips when occupants sit near the side rail or foot end of the bed.

TEST METHOD

Method Source: EN 1725:2023 and ISO 19833:2018 were used as procedural references. The loads, cycle counts, measurement points, and acceptance criteria stated below were selected for this evaluation.

Loads were positioned at the one-quarter and three-quarter points along the long side of the bed, 60 mm from the edge.

Horizontal outward force was applied at the loading positions and held for five seconds.

The corresponding short-side condition was also evaluated.

Baseline Test Conditions: the documented 60 kg + 60 kg, 80 kg + 80 kg, and 90 kg + 90 kg conditions.

Additional Test Conditions: 100 kg + 100 kg and 120 kg + 120 kg with a 200 N horizontal outward force.

A 20 N horizontal outward force was applied under each Baseline Test Condition. A 200 N horizontal outward force was applied under each Additional Test Condition.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied to this evaluation:

The opposite end of the bed must not lift.

The bed must not tip during testing.

The no-lift and no-tip criteria apply to both the Baseline and Additional Test Conditions listed above.

TEST RESULTS

Applied load	Lateral force	Lifting or tipping observed	Recorded result
60 kg + 60 kg Baseline Test Condition	20N	No	Pass — met the stated acceptance criterion under the Baseline Test Condition
80 kg + 80 kg Baseline Test Condition		No	
90 kg + 90 kg Baseline Test Condition		No	

100 kg + 100 kg Additional Test Condition	200 N	No	Pass — met the stated acceptance criterion under the Additional Test Condition; no lifting or tipping observed
120 kg + 120 kg Additional Test Condition		No	





4.1.4 Side-Rail Vertical Load

TEST PURPOSE

To evaluate the side rail under loading associated with sitting at the bed edge or getting into bed.

TEST METHOD

Method Source: EN 1725:2023 and ISO 19833:2018 were used as procedural references. The loads, cycle counts, measurement points, and acceptance criteria stated below were selected for this evaluation.

Two vertical loads were applied simultaneously at positions 300 mm apart on either side of the side-rail centerline.

Each condition was held for one minute.

The measurement point was the center of the side rail between the two loading positions.

Baseline Test Condition: a total load of 2,400 N. Additional Test Conditions: total loads of 4,000 N and 4,500 N.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied to this evaluation:

Under the 2,400 N Baseline Test Condition, deformation must be less than 7 mm.

The side rail must show no fracture, separation, permanent loosening, or loss of function.

The 4,000 N and 4,500 N Additional Test Conditions document deformation and failure behavior only and have no separate pass/fail criterion.

TEST RESULTS

Total load	Unit	Criterion	Before	After	Change	Recorded result
2,400 N Baseline Test Condition	mm	<7 mm	369.2	363.0	6.2	Pass — met the stated acceptance criterion under the Baseline Test Condition
4,000 N Additional Test Condition	mm	No separate pass/fail criterion	363.0	364.8	1.8	Observation only — no separate pass/fail criterion; no abnormality recorded
4,500 N Additional Test Condition	mm	No separate pass/fail criterion	364.8	363.8	1.0	





4.1.5 Individual Slat and Center-Rail Strength

TEST PURPOSE

To evaluate the strength of individual slats and the center rail under concentrated vertical loading.

TEST METHOD

The evaluation was performed using the conditions stated below.

Baseline Test Condition: The 500 N condition is assessed by reference to the 1,500 N assembled mattress-platform evaluation in Section 4.1.2. No separate 500 N test was performed.

Boundary/Destructive Condition: individual slats and the center rail were loaded directly without a test mattress. Loading was applied through a 100 mm diameter pad at the midpoint between adjacent support points. Force was increased until severe deformation or fracture occurred. Slat test points were identified as A1, A2, and A3; the center-rail test point was identified as B1.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied to this evaluation:

The assessment referenced from Section 4.1.2 considers fracture and loss of intended function in the assembled mattress platform. No separate deformation-limit assessment is made for the 500 N condition.

Boundary/Destructive Condition values record failure behavior only and are not assigned a pass/fail result. They do not represent safe working loads, product ratings, or recommended conditions of use.

TEST RESULTS

Evaluation	Load(Unit N)	Test observation	Recorded result
Assessment based on Section 4.1.2	500	The assembled mattress platform withstood 1,500 N without recorded slat or supporting-component fracture or loss of intended function.	Performance at 500 N is inferred from the 1,500 N assembled-platform result; not separately tested.
Boundary/Destructive Condition — individual slats	1,570 / 1,620 / 1,780	Fracture occurred after the recorded point-load values	Boundary observation only — not a safe working load, product rating, or recommended condition of use
Boundary/Destructive Condition — center rail	2,630	Fracture occurred after the recorded point-load value	





4.1.6 Mattress-Platform Vertical Impact

TEST PURPOSE

To evaluate the mattress platform, slats, center rail, and structural connections under sudden sitting, drop-down, or impact-type loading.

TEST METHOD

Method Source: EN 1725:2023 and ISO 19833:2018 were used as procedural references. The loads, cycle counts, measurement points, and acceptance criteria stated below were selected for this evaluation.

Measurement points included the center of the mattress platform, one-third-length positions, locations 200 mm from adjacent edges, slat-center positions, and the center-rail position near the headboard.

Baseline Test Condition: one 25 kg impactor drop from 180 mm above the unloaded mattress surface.

Additional Test Conditions: one 50 kg impactor drop from 100 mm, 150 mm, 200 mm, and 250 mm.

ACCEPTANCE CRITERIA

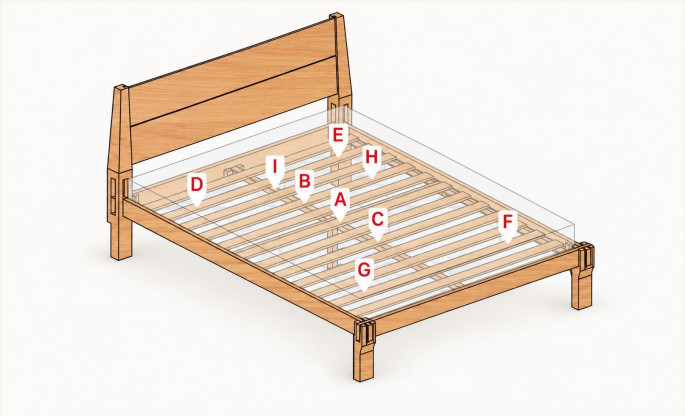
The following acceptance criteria were applied to this evaluation:

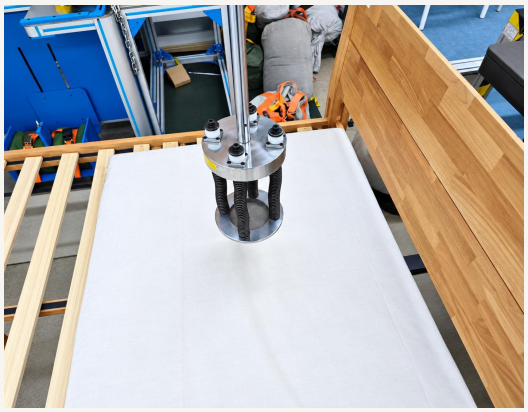
Under the 25 kg Baseline Test Condition, the height change at each measurement point must not exceed 5 mm.

Under the 50 kg Additional Test Conditions, the bed must not tip, fracture, separate, permanently loosen, or lose basic function.

TEST RESULTS

Load	Drop height	A	B	C	D	E	F	G	H	I	Recorded result
Baseline before test/ mm		305	308	316	333	333	336	327	330	312	-
25 kg Baseline Test Condition	180 mm	306	308	312	336	335	334	329	328	311	Pass — met the stated acceptance criterion under the Baseline Test Condition
50 kg Additional Test Condition	100 mm	306	309	313	335	335	333	328	328	310	Pass — met the stated acceptance criterion under the Additional Test Condition; no abnormality recorded
50 kg Additional Test Condition	150 mm	305	309	314	336	335	333	330	329	309	
50 kg Additional Test Condition	200 mm	305	309	313	337	336	334	330	328	309	
50 kg Additional Test Condition	250 mm	305	309	313	336	334	337	328	330	310	
Maximum change / mm		1	1	4	4	3	3	3	2	3	Within the stated acceptance criteria





4.1.7 Bed-Frame Horizontal Durability

TEST PURPOSE

To evaluate whether the bed frame maintains squareness and structural rigidity after repeated lateral movement.

TEST METHOD

Method Source: EN 1725:2023 and ISO 19833:2018 were used as procedural references. The loads, cycle counts, measurement points, and acceptance criteria stated below were selected for this evaluation.

A 50 kg specified mass was placed at the center of the mattress platform.

Alternating horizontal forces of 150 N were applied at the prescribed bed-end locations.

Test frequency did not exceed five cycles per minute.

Baseline Test Condition: 2,500 cycles.

Additional Test Condition: continued cycling through 10,000 cycles.

ACCEPTANCE CRITERIA

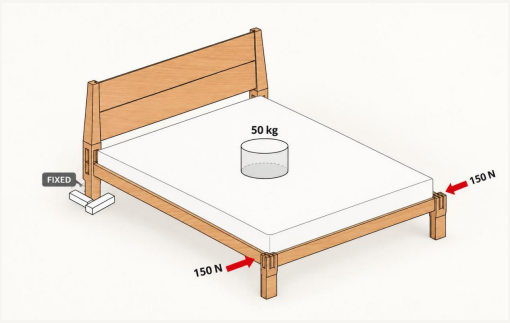
The following acceptance criteria were applied to this evaluation:

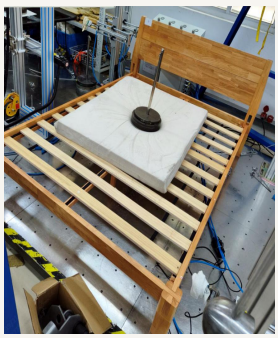
After the 2,500-cycle Baseline Test Condition, the difference between diagonal measurements LA and LB must not exceed 3 mm.

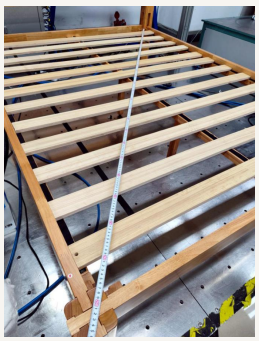
After the Baseline Test Condition, the bed must show no tipping, mortise fracture, connection separation, permanent loosening, or loss of function. During the Additional Test Condition through 10,000 cycles, the same structural-integrity requirements apply and the diagonal difference is recorded at each checkpoint.

TEST RESULTS

Stage	Cycle count	Diagonal LA	Diagonal LB	Delta L	Recorded result
Initial measurement		2,466 mm	2,465 mm	1 mm	Reference measurement
Baseline Test Condition	2,500	2,465 mm	2,465 mm	0 mm	Pass — met the stated acceptance criterion under the Baseline Test Condition
Additional Test Condition	3,000	2,465 mm	2,465 mm	0 mm	Pass — met the stated acceptance criterion under the Additional Test Condition; no abnormality recorded
	4,000	2,465 mm	2,465 mm	0 mm	
	5,000	2,465 mm	2,464 mm	1 mm	
	5,500	2,464 mm	2,465 mm	1 mm	
	6,000	2,465 mm	2,465 mm	0 mm	
	6,500	2,465 mm	2,465 mm	0 mm	
	7,000	2,466 mm	2,464 mm	2 mm	
	7,500	2,464 mm	2,465 mm	1 mm	
	8,000	2,464 mm	2,465 mm	1 mm	
	8,500	2,465 mm	2,465 mm	0 mm	
	9,000	2,466 mm	2,463 mm	3 mm	
	9,500	2,466 mm	2,463 mm	3 mm	
	10,000	2,466 mm	2,463 mm	3 mm	









4.1.8 Headboard Horizontal Static Load and Durability

TEST PURPOSE

To evaluate headboard stability when users lean against it for reading, resting, or sitting on the bed.

TEST METHOD

Method Source: EN 1725:2023 and ISO 19833:2018 were used as procedural references. The loads, cycle counts, measurement points, and acceptance criteria stated below were selected for this evaluation.

This method applies to beds wider than 1,200 mm.

Two 100 kg masses were positioned 300 mm to either side of the centerline.

Two 200 N horizontal forces were applied simultaneously.

The loading point was the lower of: 600 mm above the mattress platform, or 100 mm below the top of the headboard.

Baseline Test Condition: 10 cycles.

Additional Test Condition: continued cycling through 100 cycles. Boundary/Destructive Condition: two 400 N horizontal forces, or 800 N total.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied to this evaluation:

After the 10-cycle Baseline Test Condition, the change in headboard angle, Delta theta, must be less than 0.3 degrees.

After the Baseline Test Condition, maximum displacement at the highest point must not exceed 5 mm.

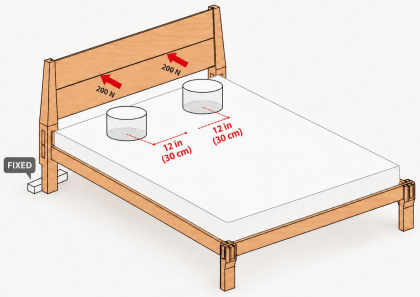
After the Baseline Test Condition, the bed must show no tipping, mortise fracture, connection separation, permanent loosening, or loss of function. The 20–100-cycle Additional Test Condition and the 800 N Boundary/Destructive Condition document behavior beyond the baseline. No separate pass/fail criterion is assigned to these conditions.

TEST RESULTS

Stage	Cycles	Initial angle	Angle under load	Residual angle	Changed angle	Result
Baseline Test Condition	10	84.95°	82.95°	84.75°	0.2° / approx. 3.5 mm	Pass — met the stated acceptance criterion under the Baseline Test Condition

Additional Test Condition	20	/	83.10°	84.40°	0.55°	Observation only — no separate pass/fail criterion; see note below
	30		83.10°	84.10°	0.85°	
	40		83.05°	84.35°	0.60°	
	50		82.75°	84.15°	0.80°	
	60		83.05°	84.15°	0.80°	
	70		82.90°	84.15°	0.80°	
	80		83.05°	84.05°	0.90°	
	90		83.10°	84.05°	0.90°	
	100		83.20°	84.05°	0.90°	







During the extended condition, the headboard was freestanding rather than supported by a wall. The wooden locking wedge showed signs of loosening during fatigue loading and should be checked after long-term use or relocation.

At a destructive boundary condition of 400 N at each of two loading points, or 800 N total, the headboard tenon fractured.

4.1.9 Mattress-Platform Vertical Durability

TEST PURPOSE

To evaluate mattress-platform performance under repeated loading associated with dual sleepers, entering and exiting bed, and repeated body movement.

TEST METHOD

Method Source: EN 1725:2023 and ISO 19833:2018 were used as procedural references. The loads, cycle counts, measurement points, and acceptance criteria stated below were selected for this evaluation.

A cyclic load of 1,200 N was applied through a 100 mm diameter loading pad at Points A, B, C, and D.

Test frequency was approximately one cycle every two seconds.

Baseline Test Condition: 10,000 cycles.

Additional Test Condition: continued cycling through 20,000 cycles.

ACCEPTANCE CRITERIA

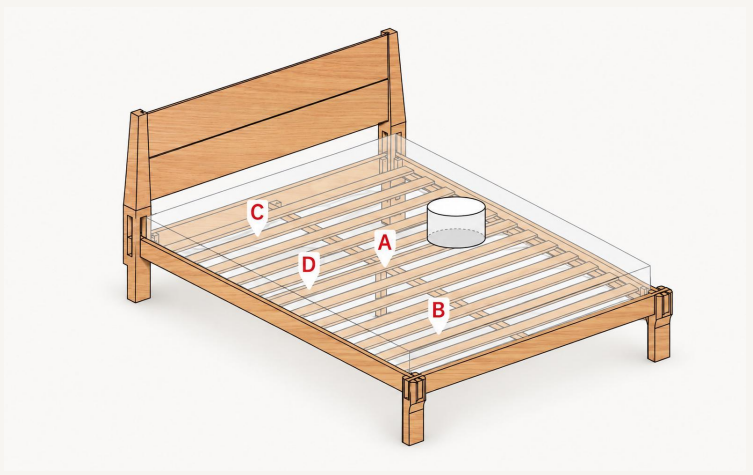
The following acceptance criteria were applied to this evaluation:

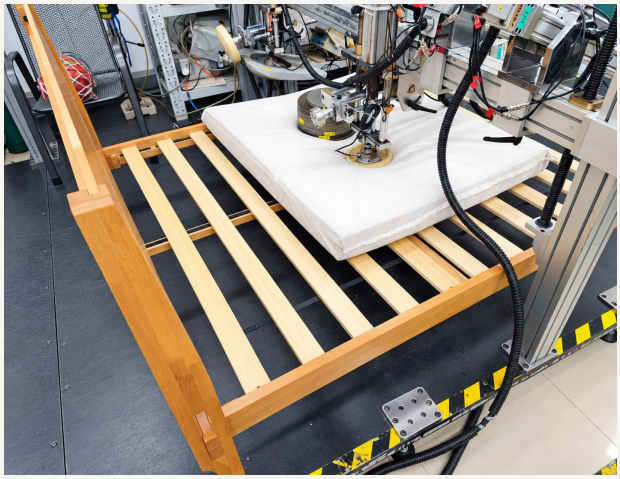
Under the 10,000-cycle Baseline Test Condition, height change at the measured points must not exceed 10 mm.

Under the 20,000-cycle Additional Test Condition, the bed must not tip, fracture, separate, permanently loosen, or lose basic function.

TEST RESULTS

Stage	Cycle count	A	B	C	D	Recorded result
Before testing	-	307 mm	335 mm	328 mm	338 mm	-
Baseline Test Condition checkpoint	5,000	305 mm	328 mm	322 mm	328 mm	Interim measurement; baseline sequence not yet complete
Baseline Test Condition	10,000	305 mm	328 mm	322 mm	335 mm	Pass — met the stated acceptance criterion under the Baseline Test Condition
Additional Test Condition checkpoint	15,000	305 mm	328 mm	321 mm	338 mm	Interim Additional Test Condition measurement; no abnormality recorded
Additional Test Condition	20,000	307 mm	335 mm	328 mm	338 mm	Pass — met the stated acceptance criterion under the Additional Test Condition; no abnormality recorded
Maximum change	-	2 mm	7 mm	7 mm	10 mm	-





4.1.10 Mortise-and-Tenon Connection Strength During Moving

TEST PURPOSE

To evaluate connection performance when the bed is moved while assembled.

TEST METHOD

The evaluation was performed using the conditions stated below.

Baseline Test Condition: a uniformly distributed 75 kg load was placed on the assembled bed.

The head end and foot end were lifted separately.

The bed was dragged for 1 m.

Additional Test Condition: the procedure was repeated for five cycles.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied to this evaluation:

After the one-cycle Baseline Test Condition, connections must not separate, crack, permanently loosen, or lose function.

After the five-cycle Additional Test Condition, connections must not separate, crack, permanently loosen, or lose function.

TEST RESULTS

Cycle	Test observation	Recorded result
1 Baseline Test Condition	Normal movement; no change in tenon or whole-bed strength	Pass — met the stated acceptance criterion under the Baseline Test Condition
2-5 Additional Test Condition	Normal movement; no change in tenon or whole-bed strength	Pass — met the stated acceptance criterion under the Additional Test Condition; no abnormality recorded



4.1.11 Mortise-and-Tenon Turning Strength

TEST PURPOSE

To evaluate torsional loading on the frame and mortise-and-tenon joints during moving or cleaning.

TEST METHOD

The evaluation was performed using the conditions stated below.

- Two legs on one side of the bed were used as pivot points.
- The complete bed was lifted and turned through an angle of at least 45 degrees.
- Both long sides were tested in sequence.
- Baseline Test Condition: 10 cycles.

Additional Test Condition: cycling continued through 50 cycles, with checkpoints at 20, 30, 40, and 50 cycles.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied to this evaluation:

After the 10-cycle Baseline Test Condition, the frame and connections must not separate, crack, permanently loosen, or lose function.

After the 20–50-cycle Additional Test Condition, the frame and connections must not separate, crack, permanently loosen, or lose function.

TEST RESULTS

Cycle count	Test observation	Recorded result
10 Baseline Test Condition	The bed remained intact, with no cracking or damage to the mortise-and-tenon joints at the load-bearing ends.	Pass — met the stated acceptance criterion under the Baseline Test Condition
20 Additional Test Condition		Pass — met the stated acceptance criterion under the Additional Test Condition; no abnormality recorded
30 Additional Test Condition		
40 Additional Test Condition		
50 Additional Test Condition		

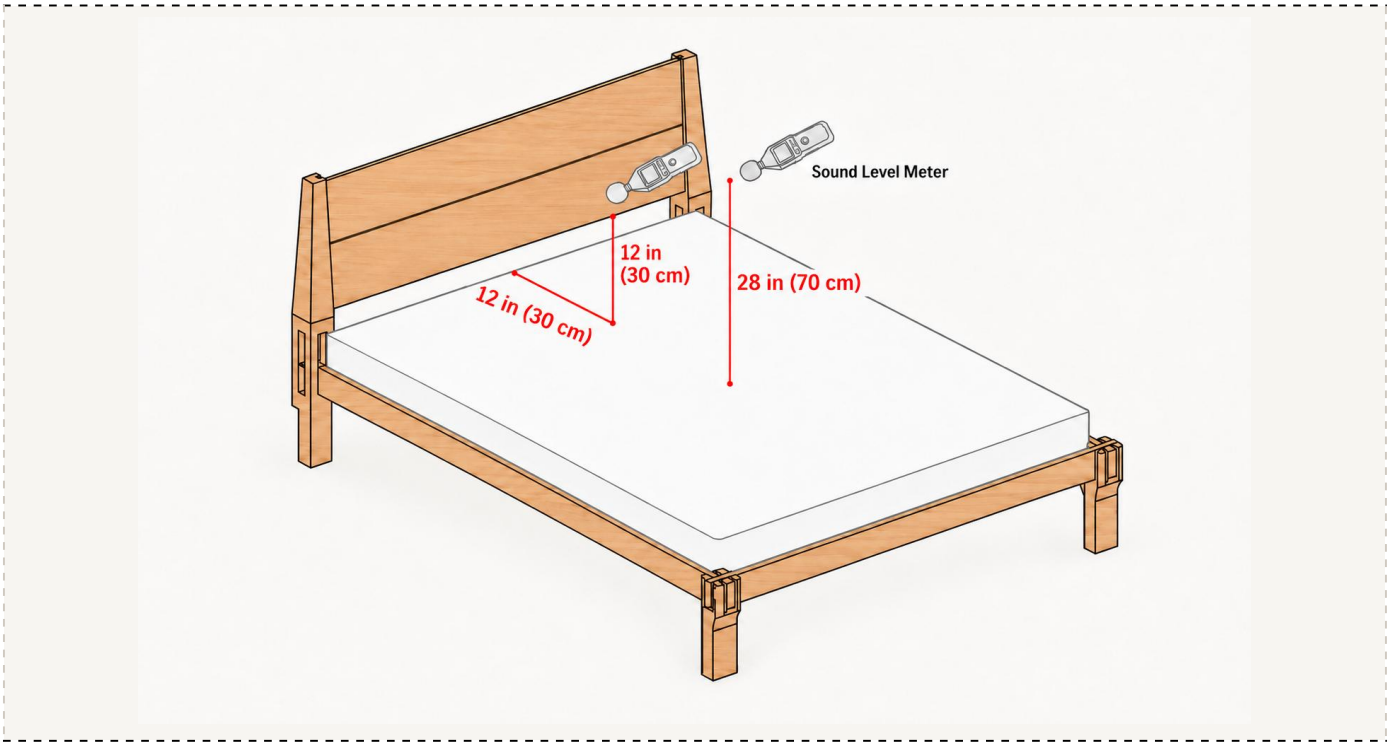


SECTION FOUR

4.2 Noise Performance

Kana's noise evaluations examine whether the assembled bed produces persistent, sharp, repeatable, or clearly localizable abnormal sounds during common movements, including entering and exiting bed, turning over, leaning against the headboard, and repeated dynamic movement. Background sound and action sound are recorded separately at defined measurement positions.

These evaluations are observational sound checks rather than standardized sound-power or sound-emission ratings. Recorded action levels may include sound from the tester, mattress, and bed frame. Results are therefore assessed against the abnormal-sound definition stated below and should not be interpreted as a universal decibel rating or a claim that the bed produces no sound.



4.2.1 Noise During Entering and Exiting Bed

TEST PURPOSE

To evaluate potential impact, friction, or connection noise while sitting down, getting into bed, and getting out of bed.

TEST METHOD

The evaluation was performed using the conditions stated below.

Sound samples were collected before durability testing (Section 4.1.7) and after the documented Additional Test Condition in the horizontal-durability evaluation.

A tester weighing 110 kg and measuring 175 cm simulated normal entry and exit movements.

The tester used a fixed position and consistent movement rhythm.

ACCEPTANCE CRITERIA

The following acceptance criterion was applied to this evaluation:

No persistent, sharp, repeatable, or clearly localizable abnormal sound may occur during the test movement.

TEST RESULTS

Stage	Unit	Background sound	Action sound	Abnormal noise	Result / observation
Before durability testing	dB	40	A: 46 / B: 43	None	No abnormal sound recorded under the stated procedure
After the Additional Test Condition in horizontal durability (Section 4.1.7)	dB	38	A: 43 / B: 40	None	No abnormal sound recorded under the stated procedure

4.2.2 Noise During Turning Over

TEST PURPOSE

To evaluate potential noise from slats, side rails, the center support, or structural connections during normal turning movements.

TEST METHOD

The evaluation was performed using the conditions stated below.

Sound measurements were recorded before the headboard horizontal static-load and durability evaluation in Section 4.1.8 and after 10,000 mattress-platform vertical-durability cycles in Section 4.1.9.

The bed was fitted with a 100 mm test mattress.

A tester weighing 110 kg and measuring 175 cm simulated normal left-to-right turning movements.

The tester used a fixed position and consistent movement rhythm.

ACCEPTANCE CRITERIA

The following acceptance criterion was applied to this evaluation:

No persistent, sharp, repeatable, or clearly localizable abnormal sound may occur during the test movement.

TEST RESULTS

Stage	Unit	Background sound	Action sound	Abnormal noise	Result / observation
Before durability testing (Section 4.1.8)	dB	40	A: 46 / B: 44	None	No abnormal sound recorded under the stated procedure
After 10,000 mattress-platform vertical-durability cycles (Section 4.1.9)	dB	38	A: 41 / B: 40	None	No abnormal sound recorded under the stated procedure

4.2.3 Noise While Leaning Against the Headboard

TEST PURPOSE

To evaluate potential loosening, friction, or impact noise while leaning against the headboard for reading or resting.

TEST METHOD

The evaluation was performed using the conditions stated below.

Sound samples were collected Before mattress-platform vertical-durability evaluation (Section 4.1.9) and after the documented headboard-loading condition.

The bed was fitted with a 100 mm test mattress.

A tester weighing 110 kg and measuring 175 cm simulated normal leaning movements against the headboard.

The tester used a fixed position and consistent movement rhythm.

ACCEPTANCE CRITERIA

The following acceptance criterion was applied to this evaluation:

No persistent, sharp, repeatable, or clearly localizable abnormal sound may occur during the test movement.

TEST RESULTS

Stage	Unit	Background sound	Action sound	Abnormal noise	Result / observation
Before mattress-platform vertical-durability evaluation (Section 4.1.9)	dB	40	A: 55.8 B: 50.9	None	Recorded sound attributed to tester movement; no abnormal bed sound identified
After headboard-loading evaluation (Section 4.1.8)		38	A: 50.9 B: 60.0	None	No abnormal sound recorded under the stated procedure



Recorded action levels include sound from the tester, mattress, and bed frame. These readings describe observations at the stated test stages and should not be interpreted as isolating the effect of a single durability test or as a claim of zero sound.

4.2.4 Noise During Repetitive Dynamic Movement

TEST PURPOSE

To evaluate potential abnormal sound during repeated front-to-back motion of the bed surface.

TEST METHOD

The evaluation was performed using the conditions stated below.

The bed was assembled and fitted with a 100 mm test mattress.

The tester moved the mattress platform forward and backward once every two seconds.

Background sound and action sound were measured at Points A and B.

ACCEPTANCE CRITERIA

The following acceptance criterion was applied to this evaluation:

No persistent, sharp, repeatable, or clearly localizable abnormal sound may occur during the test movement.

TEST RESULTS

Stage	Unit	Background sound	Action sound	Abnormal noise	Result / observation
Before testing	dB	40	A: 51 / B: 45	None	No abnormal sound recorded under the stated procedure
After testing		38	A: 45 / B: 41	None	No abnormal sound recorded under the stated procedure

SECTION FOUR

4.3 Transportation Reliability

Kana's transportation evaluations examine whether the packaging retains its protective function during the stated distribution, drop, and stack-compression procedures. Product condition is checked for damage that could affect assembly, appearance, safety, or intended use.

The ISTA 2A distribution sequence and stack-compression evaluation are identified as Baseline Test Conditions. The additional 1.0 m drop is identified separately as an Additional Test Condition. Results apply only to the tested package configuration and procedure and do not represent a guarantee against damage under every transportation condition.

4.3.1 ISTA 2A Distribution Test and 1.0 m Additional Drop Test

TEST PURPOSE

To evaluate packaging protection against handling impacts, drops, and distribution-related movement that could damage the carton, wood components, or mortise-and-tenon connections.

TEST METHOD

Method Source: The packaged product was evaluated using the applicable ISTA 2A distribution-test sequence. After that sequence, an additional 1.0 m drop was performed on the top and bottom large faces of the package.

Baseline Test Condition: the packaged product completed the ISTA 2A distribution-test sequence applicable to its package-weight category.

Product condition was inspected after the ISTA 2A sequence.

Additional Test Condition: the top and bottom large faces of the package were dropped from 1.0 m.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied separately to both the ISTA 2A Baseline Test Condition and the 1.0 m Additional Test Condition:

The packaging must retain its basic protective function.

The product must not show cracking, deformation, or missing components that affect assembly, safety, or intended use.

TEST RESULTS

Evaluation	Result
ISTA 2A distribution sequence — Baseline Test Condition	Pass — met the stated acceptance criteria under the Baseline Test Condition
1.0 m (approximately 39.4 in) drop — Additional Test Condition	Pass — met the stated acceptance criteria under the Additional Test Condition
	
	

4.3.2 Packaging Stack-Compression Test

TEST PURPOSE

To evaluate whether the packaging protects the product during stacked warehouse storage or long-distance transportation.

TEST METHOD

Method Source: ISO 2234:2000 was used as a procedural reference for the stacking evaluation. The stack estimate, safety factor, applied load, duration, and acceptance criteria stated below were selected for this evaluation.

The loading arrangement was based on an estimated stack of approximately 10 cartons in a 40-foot high-cube container.

Gross package weight: 43.36 kg.

Safety factor: 5.

Applied force: (10 - 1) x 43.36 x 9.8 x 5 = 19,122 N.

Load duration: 24 hours. This section reports one Baseline Test Condition. No Additional Test Condition or Boundary/Destructive Condition is reported.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied to this evaluation:

The packaging must retain its protective function.

The product must not show deformation or damage affecting assembly, appearance, or function.

TEST RESULTS

Applied condition	Result
19,122 N compressive load for 24 hours	Pass — met the stated acceptance criteria under the Baseline Test Condition; product remained intact



SECTION FOUR

4.4 Materials and Environmental Responsibility

This chapter presents completed evaluations of material identity, indoor-air emissions, and surface durability. Material checks compare inspected components with the applicable bill of materials, while emissions and finish evaluations report results from the named product configuration or tested surface sample under the stated procedure.

4.4.1 Verification of Primary Materials

TEST PURPOSE

To verify that the principal bed components use the materials specified for the product.

TEST METHOD

The principal components were compared with the materials identified in the applicable bill of materials.

The headboard, frame, legs, center rail, and slats were checked against the bill of materials.

Sample sections were cut and examined for end-grain appearance, cross-sectional grain, joint construction, and material structure.

Component location, specified material, actual cross section, and joining method were documented.

ACCEPTANCE CRITERIA

The observed material characteristics were compared with the descriptions stated below.

Finger-jointed rubberwood must show interlocking finger-joint geometry at the cut end, with a light yellow-brown appearance and visible grain.

Poplar must show a pale yellow-white cross section with straight grain and a fine, uniform structure.

Plywood must show cross-laminated veneers with alternating grain direction and a veneered, finished surface.

TEST RESULTS

Material	Documented component use	Manufacturing description	Result
Rubberwood	Legs, headboard, bed frame, locking wedges	Kiln-dried and degreased; finger-jointed to length; machined to final form	Matched the stated material description for the inspected sample
Poplar	Center rail and center support legs	Kiln-dried solid poplar, cut and formed	Matched the stated material description for the inspected sample
Plywood	Mattress-support slats	Multiple veneers cross-laminated by grain direction, glued, and hot-pressed	Matched the stated material description for the inspected sample









4.4.2 GREENGUARD Whole-Bed Indoor-Air Evaluation

TEST PURPOSE

To evaluate chemical emissions from the identified rubberwood Kana Form A configuration

TEST METHOD

Method Source: UL 2821, UL GREENGUARD Certification Program Method for Measuring and Evaluating Chemical Emissions From Building Materials, Finishes and Furnishings, Edition 2.

Test Parameter	Condition
Tested product	Kana Japanese King Size Joinery Bed with Four Under-Bed Storage Drawers — Natural Walnut Finish
Environmental chamber volume	32.0 m³
Product loading	One unit / 32.0 m³
Air-change rate	1.00 ± 0.05 h^{-1}
Relative humidity	50% ± 5%
Recorded temperature	22.5–23.9°C
Exposure period	168 hours
Testing laboratory	UL Environmental Vietnam Laboratory
Indoor-air modeling basis	One bed in a 34.9 m³ bedroom at 0.45 h^{-1} air change

The completed bed was unpackaged, prepared to expose finished surfaces, and evaluated for TVOC, formaldehyde, target aldehydes, and identified individual VOCs over a 168-hour period.

ACCEPTANCE CRITERIA

Criteria Source: UL GREENGUARD Certification Criteria for Furniture and Mattresses.

Parameter	Acceptance Criterion
TVOC	≤ 0.50 mg/m³

Parameter	Acceptance Criterion
Formaldehyde	≤ 0.050 ppm / 50 ppb / 61.3 μg/m³
Total Aldehydes	≤ 0.10 ppm
4-Phenylcyclohexene	≤ 0.0065 mg/m³
Individual VOCs	≤ 1/10 of the applicable Threshold Limit Value

The product identified in the laboratory report as "Kana Japanese King Size Joinery Bed with Four Under-Bed Storage Drawers — Natural Walnut Finish" is the rubberwood Kana Form A bed evaluated in the specific King-size, four-drawer configuration described in this section. The laboratory product name is reproduced as recorded in the source report.

TEST RESULTS

Parameter	168-Hour Product Measurement	Acceptance Criterion	Result
TVOC	0.14 mg/m³	≤ 0.50 mg/m³	Met the stated criterion for the tested configuration
Formaldehyde	0.040 ppm	≤ 0.050 ppm	Met the stated criterion for the tested configuration
Total Aldehydes	0.044 ppm	≤ 0.10 ppm	Met the stated criterion for the tested configuration
4-Phenylcyclohexene	< 0.004 mg/m³	≤ 0.0065 mg/m³	Met the stated criterion for the tested configuration
Individual VOCs	All applicable compounds met the criterion	≤ 1/10 TLV	Met the stated criterion for the tested configuration

4.4.3 Finish Cross-Cut Classification

TEST PURPOSE

To assess the coating's resistance to separation following cross-cutting and tape removal under the stated procedure.

TEST METHOD

Method Source: ISO 2409:2020 and ASTM D3359-23 were used as method references for the tested coated sample.

A six-blade cross-cut tool with 1 mm spacing was used on the hardwood surface.

The cut passed through the coating to the substrate.

Loose material was removed with a soft brush.

Standardized adhesive tape was applied uniformly, pressed to eliminate bubbles, left in place for one to two minutes, and removed rapidly at a 60–90 degree angle.

The test area was examined under consistent lighting.

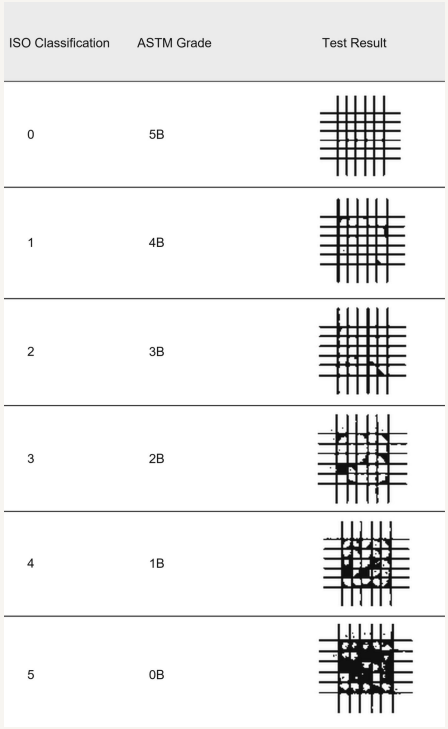
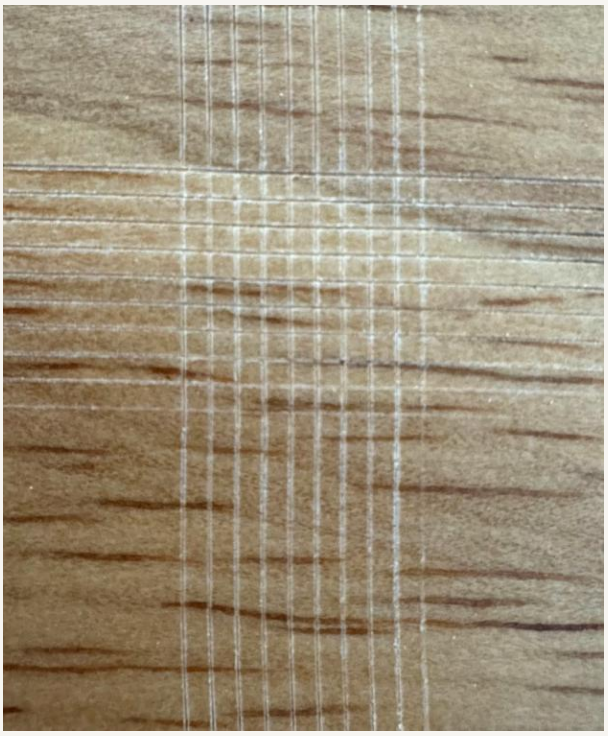
ACCEPTANCE CRITERIA

Criteria Source: The ISO 2409:2020 classification system was used to report the result. Classification 0 was selected as the acceptance criterion for this evaluation.

The tested coating must achieve ISO 2409 classification 0.

TEST RESULTS

Evaluation	Result
Cross-cut classification	Reported as ISO 2409 classification 0 for the tested coated sample.
Surface observation	Separation was observed within the wood substrate rather than at the coating interface.

Evaluation	Result
	

The test record reports ISO 2409 classification 0 for the tested surface. Separation was observed within the wood substrate rather than at the coating interface. No ASTM D3359 5B rating is claimed.

4.4.4 Artificial-Sweat Resistance

TEST PURPOSE

To evaluate coating performance under repeated contact with artificial perspiration.

TEST METHOD

Method Source: ISO 105-E04:2013 and ISO 11640 were used only as procedural references adapted for this wood-finish evaluation. The specimen, wiping conditions, and acceptance criteria stated below were selected for this evaluation; no product-conformity claim to either standard is made.

The headboard was used as the test specimen.

Gauze was immersed in artificial sweat at pH 4.7.

Wiping frequency: 40–60 cycles per minute; stroke length: 100 mm; total: 1,000 cycles.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied to this evaluation:

The surface must show no coating loss, substrate exposure, obvious whitening, or gloss loss after testing.

TEST RESULTS

Evaluation	Result	
Artificial-sweat wiping, 1,000 cycles	Very slight fading recorded; no coating loss, substrate exposure, obvious whitening, or gloss loss	
Before	**During Test**	**After**
		
The test was designed to represent routine contact with perspiration and the associated rubbing that may occur during everyday use. After testing, only trace color transfer or fading was observed and was considered visually negligible.		

4.4.5 Alcohol Resistance

TEST PURPOSE

To observe the finish's response to controlled exposure to high-concentration ethanol combined with repeated rubbing.

TEST METHOD

Method Sources: EN 12720:2009+A1:2013 and ASTM D5402-15 (2021) were used as procedural references. The ethanol concentration, applied load, wiping conditions, and acceptance criteria stated below were selected for this evaluation.

The bed frame was used as the test specimen.

Four layers of gauze were saturated with 99% ethanol and connected to a 1,000 g load.

Wiping frequency: 50–60 cycles per minute; stroke length: 150 mm; total: 100–200 cycles.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied to this evaluation:

The surface must show no coating loss, substrate exposure, obvious whitening, or gloss loss after testing.

TEST RESULTS

Evaluation	Result	
Ethanol wiping, 100-200 cycles	Slight color loss recorded; no coating loss or substrate exposure recorded	
Before	**During Test**	**After**
		

This was a controlled laboratory solvent-exposure evaluation and is not a recommended cleaning procedure. Slight color transfer was observed under the stated test conditions. Alcohol and other organic solvents may soften or partially dissolve the finish, causing discoloration or color transfer.

Warning: Do not clean the bed-frame surface with alcohol-based solutions or other organic solvents.

4.4.6 Pencil Hardness

TEST PURPOSE

To evaluate the finished surface against scratching from fingernails and common household objects.

TEST METHOD

Method Source: ISO 15184:2020 was used as a procedural reference. The test was performed using the conditions stated below.

Pencil leads were prepared to a flat tip using 400-grit abrasive paper.

A 750 g pencil-hardness tester was applied at 45 degrees to the test surface.

Five individual lines were produced at each hardness level; graphite marks were erased before evaluation.

Testing progressed from HB through 1H, 2H, 3H, and higher hardness levels.

ACCEPTANCE CRITERIA

The reported pencil-hardness level is the highest tested grade at which no visible scratching was recorded.

TEST RESULTS

Pencil grade	Observed condition
2H	No visible scratching recorded
3H	Visible scratches recorded
During Test	**After**
	

The finish achieved a pencil-hardness rating of 2H. Visible scratching was observed when tested with a 3H pencil. No visible scratching was observed at the HB or H test levels. These results provide a comparative indication of resistance to light everyday abrasion but should not be interpreted as a direct simulation of contact with keys, rings, or other hard objects.

SECTION FOUR

4.5 User Experience

Kana's user-experience evaluations examine whether the product can be identified, oriented, assembled, adjusted, and repeatedly reassembled in accordance with the installation guide. The review focuses on component identification, installation order, connection seating, center-support adjustment, slat positioning, and stability after repeated assembly.

These evaluations are based on the stated manual version, product configuration, tested sample, and acceptance criteria described below. The results document the observed installation and reassembly performance of that sample and do not guarantee identical assembly times or outcomes in every setting.

4.5.1 Installation Experience and Error-Prevention Review

TEST PURPOSE

To evaluate whether the installation system provides a clear assembly sequence, identifiable components, understandable orientation cues, and practical safeguards against common assembly errors.

The review focuses on the customer-facing installation experience: identifying the correct parts, distinguishing headboard and foot-end orientation, securing structural connections in the correct sequence, supporting the center rail correctly, and positioning the slats as intended.

TEST METHOD

The specified version of the Kana Bed Frame with Headboard User Manual was reviewed for component identification, installation sequence, orientation guidance, connection seating, center-support adjustment, and slat positioning.

Review the complete accessory list, exploded-view drawing, part labels, and 11-step illustrated assembly sequence.

Confirm that structural components, fastening hardware, wooden wedges, center-support components, and slat sets can be identified from the installation guide.

Review whether orientation information is provided before structural connections are seated.

Review whether the assembly sequence identifies the headboard end, foot end, side rails, top orientation, back orientation, and wall-facing direction where relevant.

Review whether the guide identifies the slat-installation method and center-support adjustment method.

ACCEPTANCE CRITERIA

The following review criteria were applied:

All supplied hardware and major structural components must be identifiable by illustration, reference number, and quantity.

The guide must present a logical installation order from frame positioning through final slat installation.

Key orientation differences must be visually distinguishable before structural components are secured.

Connection points must be shown in their fully seated position before the user proceeds to the next step.

The mattress-support slats must have a defined installation position and retention method.

TEST RESULTS

Review item	Verification evidence	Result
Accessory identification	Four accessory categories with reference numbers and quantities: hand-turning bolts, metal plate, spring washers, and related fasteners.	Met the stated review criterion
Major-component identification	Exploded view labels main components.	Met the stated review criterion
Assembly sequence	Illustrates the full sequence from component placement to final slat installation.	Met the stated review criterion
Orientation guidance	Relevant cues include Top, Back, Wall, Side, and Foot of the Bed.	Met the stated review criterion
Headboard-leg differentiation	Two headboard-leg components are shown separately with dedicated orientation diagrams.	Met the stated review criterion
Connection seating	Key mortise-and-tenon connections are shown in their seated position before the next stage.	Met the stated review criterion

Progress-control instruction	Multiple steps instruct the user to secure components before moving to the next installation step.	Met the stated review criterion
Headboard fastening	Headboard is secured with supplied hand-turning bolts and spring washers after frame alignment.	Met the stated review criterion
Center-support installation	Center rail, metal plate, and support legs are installed before completion of the mattress platform.	Met the stated review criterion
Height adjustment	Center-support legs include rotating adjustable bolts for floor-contact adjustment.	Met the stated review criterion
Slat-positioning guidance	Slats align through designated locations using wood dowels and hook-and-loop attachment points.	Met the stated review criterion
Wooden-wedge installation	Wooden wedges are installed after the main frame is seated to secure designated joints.	Met the stated review criterion
External-tool requirement	Guide identifies hand-turning bolts and does not specify an additional external tool.	Met the stated review criterion
Handling guidance	Main frame-positioning illustration depicts two people handling the connected bed structure.	Met the stated review criterion

4.5.2 Repeated Assembly and Disassembly Stability

TEST PURPOSE

To evaluate whether repeated assembly and disassembly affect structural stability or assembly function.

TEST METHOD

The evaluation was performed using the conditions stated below.

Baseline Test Condition: the bed was completely disassembled and reassembled 20 times according to the instruction manual.

Assembly time was recorded at cycles 1, 5, 10, 15, and 20.

Tenon and hardware fit were checked during each assembly.

Diagonal measurements were recorded at the same intervals.

ACCEPTANCE CRITERIA

The following acceptance criteria were applied to this evaluation:

No tenon chipping, connection failure, inability to assemble, or permanent loosening may occur.

The difference between diagonal measurements LA and LB must not exceed 3 mm after repeated assembly.

TEST RESULTS

Assembly Record	Assembly Time	Abnormal Condition	Diagonal LA	Diagonal LB
1	20 min	None	2465 mm	2465 mm
5	22 min	None	2465 mm	2464 mm
10	21 min	None	2464 mm	2465 mm
15	23 min	None	2465 mm	2464 mm
20	19 min	None	2465 mm	2464 mm

SECTION FOUR

4.6 Product Safety

Kana's product-safety inspection evaluates the assembled bed at the surfaces and boundaries encountered during everyday use. The review covers external dimensions, mattress space, frame and slat height, visible wood condition, exposed edges, component interfaces, and other conditions that could affect normal contact with the product.

Natural wood may vary in grain, tone, and the presence of occasional knots. These material characteristics are not treated as defects solely because they differ between components. The assembled product must nevertheless meet the inspection criteria stated below, including the absence of sharp edges, burrs, cracks, loose surfaces, or dimensional conditions that could affect safe and intended use.

4.6.1 External Dimensions and Boundary Inspection

TEST PURPOSE

To verify that the assembled bed provides the intended mattress space, overall dimensions, frame height, and visible-surface condition, while identifying safety-relevant issues such as sharp edges, burrs, or cracking.

TEST METHOD

Method Source: ISO 24975:2026 and EN 1334:1996 were used as measurement references. The target dimensions, tolerances, and visible-surface requirements stated below were taken from the supplied product record and approved product sample.

The bed was fully assembled according to the instruction manual.

Overall length, width, and height were measured at specified locations using a tape measure.

Frame height, slat height, internal length, and internal width were measured.

Under specified lighting conditions, major visible surfaces were inspected for wood grain, color variation, knots, cracks, and burrs.

The inspection was completed on the assembled bed to confirm that component interfaces, visible boundaries, and mattress-support space remained suitable for normal use.

ACCEPTANCE CRITERIA — KANA FORM A

The following product-specific acceptance criteria were applied to the inspected samples. ISO 24975:2026 and EN 1334:1996 are cited as measurement references, not as a product-certification claim.

Overall dimensions must remain within 2,152 × 1,644 × 990 mm ±5 mm.

Frame height must remain within 356 ±5 mm; slat height within 337 ±5 mm.

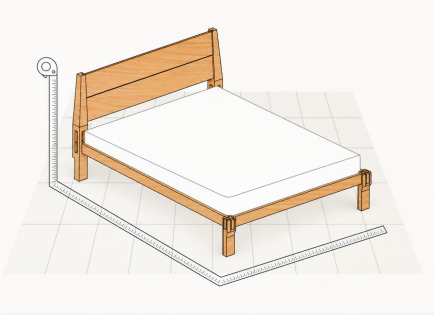
The supplied record states an internal mattress-space target of 2,032 × 1,524 mm with a +5 mm upper tolerance. No lower tolerance is stated in the supplied text.

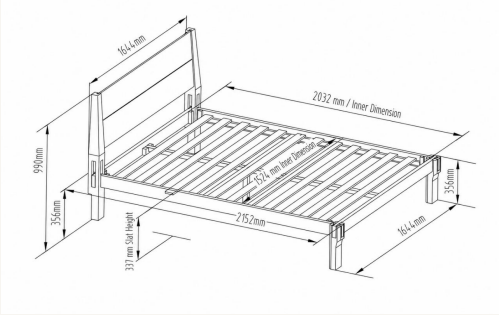
A mattress must fit and function normally within the frame.

Major visible surfaces must match the approved product sample, with no sharp edges, burrs, or cracks that could affect safe use.

TEST RESULTS

Sample	Overall L x W x H (mm)	Frame / slat height (mm)	Internal L x W (mm)	Recorded result
A	2152 x 1644 x 989	357 / 333	2035 x 1526	Pass — met the stated product-specific criteria
B	2150 x 1644 x 992	359 / 333	2033 x 1527	Pass — met the stated product-specific criteria
C	2152 x 1645 x 990	358 / 333	2034 x 1527	Pass — met the stated product-specific criteria
D	2152 x 1644 x 991	357 / 334	2035 x 1526	Pass — met the stated product-specific criteria
E	2150 x 1644 x 992	358 / 333	2034 x 1526	Pass — met the stated product-specific criteria
Maximum absolute deviation	2 / 1 / 2	3 / 4	3 / 3	Pass — met the stated product-specific criteria





4.6.2 Designed Around Safe Everyday Contact

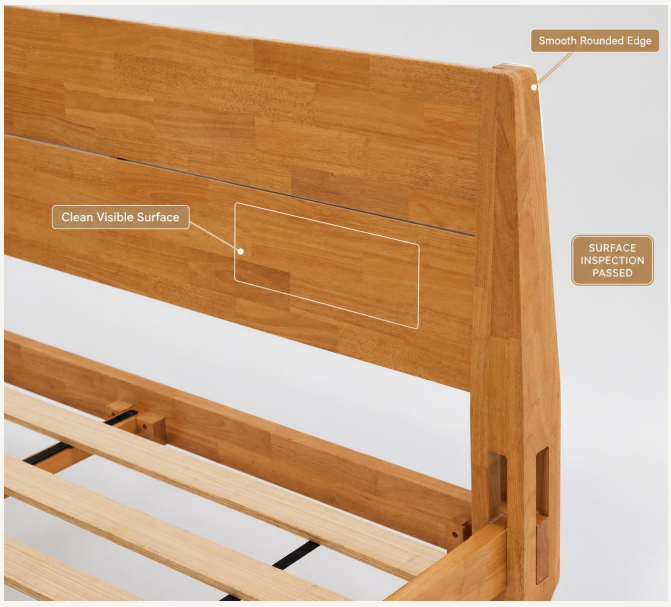
The purpose of this inspection is not simply to confirm whether the bed looks finished. It confirms whether the customer-facing boundaries of the frame are appropriate for daily life.

A side rail should not carry a burr that catches clothing or skin. A visible wood surface should not contain a crack that affects normal use. The mattress space should not require the customer to force a mattress into the frame or leave the sleep surface improperly positioned. The height and dimensions of the bed should remain consistent with the intended product specification.

By inspecting the assembled frame under controlled lighting, Kana evaluates the details that are easiest to overlook but most likely to shape daily experience: edge condition, visible surface quality, dimensional consistency, and the relationship between the mattress and the surrounding frame.

This approach treats safety as part of craftsmanship. It recognizes that a bed is experienced at close range, every day, often in low light and often when the user is tired. The inspection therefore considers not only whether the frame can be assembled, but also whether the finished product presents a clean, stable, and considered boundary to the person living with it.





SECTION FIVE

05 Certification and Supporting Evidence

Third-party evidence is meaningful only when it identifies the actual product, issuing organization, applicable standard, certificate or document number, and validity period. Kana distinguishes between independent product testing and current product certification; neither is represented more broadly than its documented scope.

5.1 Certification and Laboratory Records

Evidence Type	Covered Product	Issuer	Document No.	Applicable Standard	Validity / Date
Product certification	Kana Japanese Joinery Bed	UL Verification Services	442600-410	UL 2818:2022 / GREENGUARD	Sep. 30, 2026–Sep. 30, 2027
Product certification	Kana Underbed Drawer	UL Verification Services	442602-410	UL 2818:2022 / GREENGUARD	Sep. 30, 2026–Sep. 30, 2027
Product chamber evaluation	Kana Japanese King Size Joinery Bed with Four Under-Bed Storage Drawers — Natural Walnut Finish	UL Environmental Vietnam Laboratory	1003047328-9571256	UL 2821	Issued Sep. 24, 2026

Certification marks should only be used when the underlying document directly covers the relevant Kana product, material, or manufacturing scope. A test-method reference, a material benchmark, or a general supplier statement should not be presented as a product certification.

5.2 Certification Claim Scope

Permitted Claim	Scope
“UL GREENGUARD Certified Kana Japanese Joinery Bed”	Applies to the product named on Certificate No. 442600-410.
“UL GREENGUARD Certified Kana Underbed Drawer”	Applies only to the product named on Certificate No. 442602-410.
“Independently evaluated under UL 2821 for chemical emissions”	Applies to the completed tested configuration named in Section 4.4.2; detailed recorded data are reproduced in Section 5.5.

This white paper does not make any GREENGUARD Gold, FSC, SGS, Intertek, or TÜV product-certification claim. Any such claim requires a current document that directly covers the named product and scope.

5.3 Test Samples

Sample Category	Sample or Product Scope	Completed Evaluation Use
Assembled Kana bed frame	Fully assembled bed frame	Structural loading, impact, durability, moving, turning, noise, installation, dimensions, and safety-boundary evaluations.
Primary materials	Finger-jointed rubberwood, poplar, plywood	Material verification and finish-performance evaluations.
Packaged product	Product packed for shipment	ISTA 2A distribution, 1.0 m additional-drop, and stack-compression evaluations.
UL-tested product	Rubberwood Kana Form A, King size with four under-bed storage drawers, identified in the laboratory report as “Kana Japanese King Size Joinery Bed with Four Under-Bed Storage Drawers — Natural Walnut Finish”.	Independent whole-bed environmental-chamber evaluation.

Sample Category	Sample or Product Scope	Completed Evaluation Use
UL-certified product	Kana Japanese Joinery Bed	UL GREENGUARD certification.

5.4 Completed Test Matrix

Section	Evaluation	Method Source	Baseline / Recorded Outcome
4.1.1	Whole-bed static load	EN 1725 / ISO 19833	Pass — 700 kg baseline, 24 h
4.1.2	Mattress-platform vertical static load	EN 1725 / ISO 19833	Pass — 1,500 N baseline
4.1.3	Anti-tip stability	EN 1725 / ISO 19833	Pass — baseline and additional conditions
4.1.4	Side-rail vertical load	EN 1725 / ISO 19833	Pass — 2,400 N baseline
4.1.5	Slat and center-rail strength	Internal method	500 N inferred from Section 4.1.2; not separately tested. Fracture loads recorded.
4.1.6	Mattress-platform vertical impact	EN 1725 / ISO 19833	Pass — 25 kg / 180 mm baseline
4.1.7	Bed-frame horizontal durability	EN 1725 / ISO 19833	Pass — 2,500-cycle baseline
4.1.8	Headboard load and durability	EN 1725 / ISO 19833	Pass — 10-cycle baseline
4.1.9	Mattress-platform vertical durability	EN 1725 / ISO 19833	Pass — 10,000-cycle baseline
4.1.10	Moving connection strength	Internal method	Pass — 1-cycle baseline and 5-cycle additional condition
4.1.11	Turning connection strength	Internal method	Pass — 10-cycle baseline and 50-cycle additional condition
4.2	Noise performance	Internal method	No abnormal sound recorded
4.3.1	Distribution and additional drop	ISTA 2A	Pass — ISTA 2A and separate 1.0 m additional drop
4.3.2	Stack compression	ISO 2234	Pass — 19,122 N for 24 h

Section	Evaluation	Method Source	Baseline / Recorded Outcome
4.4.1	Primary-material verification	Internal method	Inspected materials matched specifications
4.4.2	Independent whole-bed indoor-air evaluation	UL 2821	Tested configuration met stated emission criteria at 168 h
4.4.3	Finish cross-cut classification	ISO 2409 / ASTM D3359	ISO 2409 classification 0
4.4.4–4.4.6	Finish durability	ISO / ASTM / internal	Slight fading/color transfer; pencil hardness: 2H. See detailed results
4.5.1	Installation review	Manual / internal protocol	Met stated assembly-guide review criteria
4.5.2	Repeated assembly and disassembly	Internal method	Pass — 20 cycles; maximum diagonal difference: 1 mm
4.6.1	Dimensions and boundary inspection	ISO 24975 / EN 1334	Met stated dimensional and surface criteria

5.5 Independent Laboratory Evidence

The concentration table reports µg/m³ and ppm. The compound tables report emission factors in µg/unit·h. BQL indicates below the applicable quantifiable level.

TVOC, Formaldehyde, and Total Aldehyde Concentrations (µg/m³ and ppm):

Exposure Time	TVOC (µg/m³)	Formaldehyde (µg/m³)	Formaldehyde (ppm)	Total Aldehydes (µg/m³)	Total Aldehydes (ppm)
6 h	673	106	0.087	183	0.110
24 h	397	81	0.066	125	0.080
48 h	273	68	0.055	98	0.065

Exposure Time	TVOC (μg/m³)	Formaldehyde (μg/m³)	Formaldehyde (ppm)	Total Aldehydes (μg/m³)	Total Aldehydes (ppm)
72 h	219	61	0.050	86	0.057
96 h	187	57	0.046	78	0.053
168 h	138	49	0.040	64	0.044

Target Aldehyde Emission Factors (μg/unit·h):

Compound	CAS No.	6 h	24 h	48 h	72 h	96 h	168 h
2-Butenal	4170-30-3	BQL	BQL	BQL	BQL	BQL	BQL
Acetaldehyde	75-07-0	150	106	86.4	83.2	89.6	BQL
Benzaldehyde	100-52-7	89.6	BQL	BQL	BQL	BQL	BQL
2,5-Dimethylbenzaldehyde	5779-94-2	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylbenzaldehyde	529-20-4	BQL	BQL	BQL	BQL	BQL	BQL
3- and/or 4-Methylbenzaldehyde	620-23-5 / 104-87-0	BQL	BQL	BQL	BQL	BQL	BQL
Butanal	123-72-8	BQL	BQL	BQL	BQL	BQL	BQL
3-Methylbutanal	590-86-3	BQL	BQL	BQL	BQL	BQL	BQL
Formaldehyde	50-00-0	1,670	1,280	1,060	963	922	771
Hexanal	66-25-1	666	413	307	275	205	211
Pentanal	110-62-3	64.0	BQL	BQL	BQL	BQL	BQL
Propanal	123-38-6	131	89.6	73.6	67.2	73.6	BQL

Identified Individual VOC Emission Factors (μg/unit·h):

Compound	CAS No.	6 h	24 h	48 h	72 h	96 h	168 h
2-Butoxyethanol	111-76-2	2,610	1,610	1,110	867	732	513
1-Methoxy-2-propanol	107-98-2	1,950	1,210	906	780	723	559
1-Methoxy-2-propyl acetate	108-65-6	1,790	1,230	883	708	617	451
Ethyl 3-ethoxypropionate	763-69-9	1,600	907	587	450	376	262
Dimethyl carbonate	616-38-6	1,180	802	705	631	606	496
N,N-Dimethylformamide	68-12-2	558	319	233	187	156	116
Styrene	100-42-5	538	216	109	78.3	62.8	BQL
Ethyl lactate	97-64-3	533	321	218	176	160	114
Total xylenes	1330-20-7	361	193	80.1	68.9	BQL	BQL
Methyl lactate	2110-78-3	330	158	144	121	107	BQL
Hexanal	66-25-1	304	183	136	113	106	93.6
1-Methylpropyl acetate	105-46-4	189	172	93.3	79.6	72.1	94.0
2-Ethyl-1,4-dimethylbenzene	1758-88-9	180	134	95.5	86.2	75.8	BQL
Dihydro-2(3H)-furanone	96-48-0	157	92.6	68.7	BQL	BQL	BQL
Toluene	108-88-3	140	95.3	76.0	72.7	66.5	BQL
Ethylbenzene	100-41-4	108	BQL	BQL	BQL	BQL	BQL
Benzaldehyde	100-52-7	104	BQL	BQL	BQL	BQL	BQL
Nonanal	124-19-6	104	68.9	BQL	BQL	BQL	BQL
Acetic acid	64-19-7	89.9	BQL	BQL	BQL	BQL	BQL

Compound	CAS No.	6 h	24 h	48 h	72 h	96 h	168 h
(E)-2-Octenal	2548-87-0	85.8	BQL	BQL	BQL	BQL	BQL
Benzyl alcohol	100-51-6	80.8	66.4	BQL	BQL	BQL	BQL
1-Heptyn-3-ol	7383-19-9	69.8	BQL	BQL	BQL	BQL	BQL
Trimethylbenzene, all isomers	25551-13-7	66.0	BQL	BQL	BQL	BQL	BQL