1D Nesting Calculator

Advanced One-Dimensional Cutting & Material Optimization

INSTRUCTION MANUAL

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Version:	1.0.0
Platform:	Windows 10 / 11 (.NET 8)
Languages:	English · Arabic · Greek · Dutch · French · Russian · Japanese · Italian
Themes:	Light · Midnight · Ocean · Forest

Maximize Yield. Minimize Waste.

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1 Introduction & Overview

The 1D Nesting Calculator is a professional desktop application that solves the one-dimensional bin-packing (cutting stock) problem. Given a set of required part lengths and available stock bar lengths, it determines the optimal way to cut the stock bars so that every required piece is produced with minimum material waste.

This problem appears in virtually every manufacturing environment that processes linear stock material — steel bars, pipes, timber beams, aluminium extrusions, copper rods, PVC profiles, cable, and more. Manual planning of cut patterns is time-consuming and typically results in 10-20% wasted material. The 1D Nesting Calculator routinely achieves waste rates under 5%, sometimes approaching 0%.

Key Capabilities

7	8	4	3
Optimization Algorithms	UI Languages	Color Themes	Export Formats

Typical Use Cases

- Steel fabrication — cutting rebar, structural sections (I-beams, channels, angles) to length
- Pipe cutting — plumbing, HVAC, and industrial piping systems
- Timber processing — lumber yards, furniture manufacturing, construction framing
- Aluminium extrusion — window frames, curtain walls, solar panel mounting
- Cable & conduit — electrical installations requiring pre-cut conduit lengths
- Production planning — generating Bill of Materials with cut lists

2 Getting Started

2.1 System Requirements

Component	Requirement
Operating System	Windows 10 or Windows 11 (64-bit only)
Runtime	.NET 8 Desktop Runtime (included with installer)
RAM	512 MB minimum; 2 GB recommended for large jobs (>500 parts)
Display	1280×720 minimum; 1920×1080 recommended for comfortable use
Disk Space	150 MB (application + runtime)
CPU	Any modern x64 processor. Multi-core improves UI responsiveness during calculation.

2.2 Launching the Application

1. Locate 1D_NestingCalculator.UI.exe in the application folder.

2. Double-click to launch. A branded splash screen appears for 5 seconds.
3. The main window opens with all settings restored from the previous session (theme, language, window size).
4. You are ready to start a new project immediately.

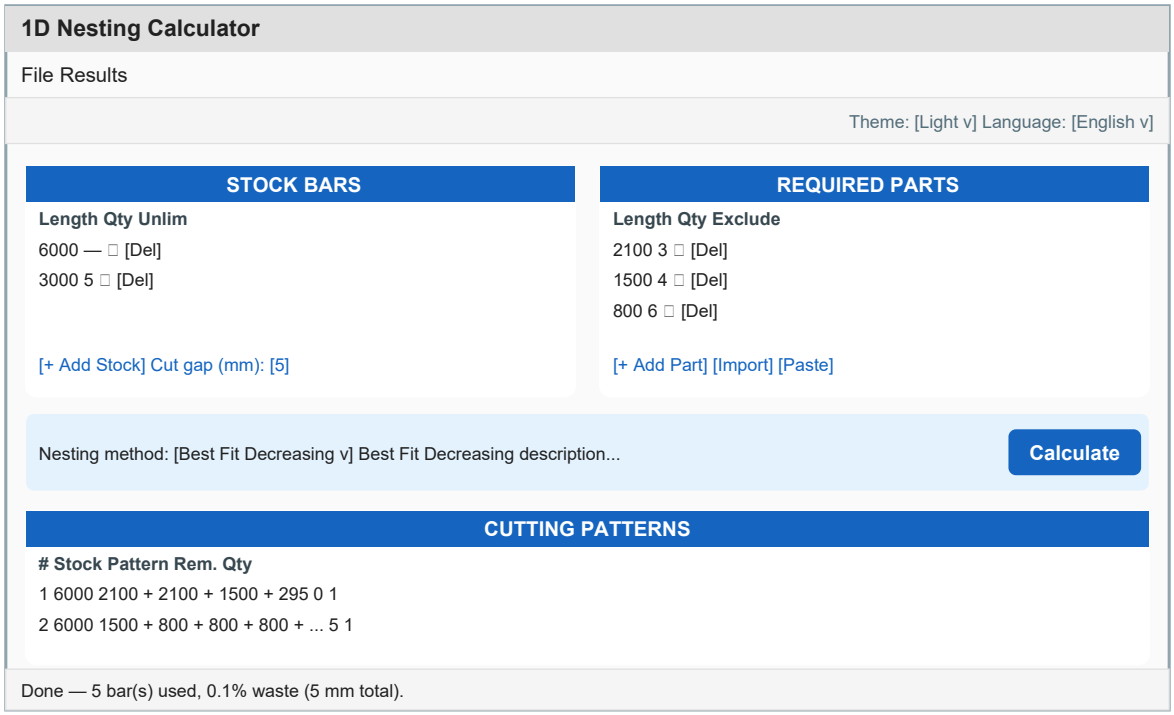
FIRST LAUNCH On first launch, default settings are: Light theme, English language, 1100×780 window. All settings are auto-saved from that point forward.

2.3 Application Splash Screen

A branded splash screen is displayed during startup. This 5-second window allows the application to initialise its dependency injection container, restore saved settings, apply the saved theme, and seed the language dictionary. A cyan gradient progress bar at the bottom animates smoothly from 0% to 100% during this period. The copyright notice is displayed above the progress bar.

3 Main Interface Overview

The main window is divided into six distinct zones, each serving a specific purpose. Understanding this layout is essential for efficient use of the application.



3.1 Zone Reference

A	**Menu Bar**	File menu (Save/Load projects) and Results menu (Export to CSV, Excel, PDF). Keyboard accelerators: Alt+F for File, Alt+R for Results.
B	**Toolbar**	Theme selector (4 themes) and Language selector (8 languages with country flags). Changes take effect instantly and are saved automatically.
C	**Stock Bars**	Left input panel. Define your available raw stock material. Each row: Length (mm), Quantity, Unlimited checkbox, Delete button.
D	**Required Parts**	Right input panel. Define the pieces you need to cut. Each row: Length (mm), Quantity,

		Exclude checkbox, Delete button. Supports Excel import and clipboard paste.
E	Controls Bar	Algorithm selection dropdown, algorithm description text, Branch & Bound time-limit slider (conditional), Calculating spinner, and the Calculate button.
F	Results & Status	Cutting Patterns grid (read-only) shows the optimized cut plans. Status bar below shows summary: bars used, waste %, total waste mm.

3.2 Keyboard Shortcuts

Key	Action
Ctrl+V	Paste parts from clipboard (when Parts grid is focused)
Alt+F	Open File menu
Alt+R	Open Results menu
Delete	Delete selected row (when grid cell is selected)

4 Managing Stock Bars

Stock bars represent your raw material inventory — the bars from which parts will be cut. You must define at least one stock bar before running a calculation. The application supports multiple stock types of different lengths, each with its own quantity constraint.

4.1 Stock Bar Fields

Field	Type	Description
Length (mm)	Number	The full usable length of one stock bar in millimetres. Must be > 0. Decimal values are accepted for precision (e.g., 5999.5 mm).
Quantity	Integer	Number of bars available. Shown as ∞ when Unlimited is checked. When not unlimited, the algorithm respects this constraint.
Unlimited	Checkbox	When checked, the algorithm may use as many bars of this type as needed. The Quantity column shows ∞. This is the typical setting for standard-length bars from a supplier.

4.2 Adding Stock Bars — Step by Step

1. Click the "+ Add Stock" button below the Stock Bars grid.
2. A new row appears with default values (Length = 0, Quantity = 1, Unlimited = unchecked).
3. Click the Length (mm) cell and type the bar length (e.g., 6000 for a standard 6-metre bar).
4. If you have a limited supply, enter the Quantity. If supply is unlimited, check the Unlimited checkbox.
5. Press Enter or Tab to confirm. The row is immediately saved in memory.
6. Repeat for each additional stock type.

MULTI-STOCK TIP You can mix stock types freely. Example: unlimited 12000 mm bars + 5 bars of 6000 mm + 10 bars of 3000 mm. The algorithm will select the most efficient combination automatically.

4.3 Cutting Gap (Saw Kerf)

The cutting gap field (below the Stock Bars grid) represents the width of material lost to each saw cut. This is typically the saw blade width plus any additional kerf. The default is 5 mm.

Saw Type	Typical Gap	Notes
Band saw (metal)	3 – 5 mm	Standard for structural steel
Cold saw (metal)	4 – 8 mm	Wider blade for precision cuts
Circular saw (timber)	3 – 4 mm	Thin kerf blades available
Plasma/laser cut	1 – 3 mm	Heat-affected zone width
Manual hacksaw	1 – 2 mm	Minimal waste

IMPORTANT A gap of 0 means cuts are treated as perfectly efficient (no material lost between cuts). This is rarely accurate in practice — always set the gap to your actual saw kerf.

5 Managing Required Parts

Required parts are the pieces you need to produce. Each part has a length and quantity. Parts can be temporarily excluded from the calculation without deleting them, which is useful for "what-if" analysis.

5.1 Part Fields

Field	Description
Length (mm)	The required cut length. Must be > 0 and ≤ the longest stock bar. Decimal values accepted.
Quantity	How many pieces of this length are needed. Must be ≥ 1.
Exclude	Temporarily removes this part from the next calculation. The row stays in the grid with greyed-out text. Useful for testing different scenarios.

5.2 Row Highlighting — Visual Feedback

RED ROW
The part length exceeds the longest available stock bar. This part is automatically excluded from the calculation because it physically cannot be cut from any available stock. Resolution: add a longer stock bar, or reduce the part length.

GREY TEXT
The part has been manually excluded by the user via the Exclude checkbox. Uncheck to re-include it in the next calculation.

5.3 Importing Parts from Excel

Two methods are available for bulk import, both expecting the same column layout:

Column A	Column B	Notes
Length (mm)	Quantity	Header row is optional — non-numeric rows are skipped

2100	3	Three pieces of 2100 mm each
1500	4	Four pieces of 1500 mm each
800	6	Six pieces of 800 mm each

Method A: File Import

1. Click the "Import Excel…" button below the Parts grid.
2. A file dialog opens. Navigate to your .xlsx file and click Open.
3. The application reads Column A and Column B from the first worksheet.
4. Imported parts are appended to the existing list (existing parts are not cleared).
5. The status bar shows: "Added N part row(s) from filename.xlsx."

Method B: Clipboard Paste (Ctrl+V)

1. In Excel, select the cells containing Length (Column A) and Quantity (Column B).
2. Copy the selection (Ctrl+C).
3. Switch to the Nesting Calculator. The Parts grid should be visible.
4. Click the "Paste from Excel" button, or press Ctrl+V while the Parts grid is focused.
5. Parts are appended immediately.

6 Nesting Algorithm Selection

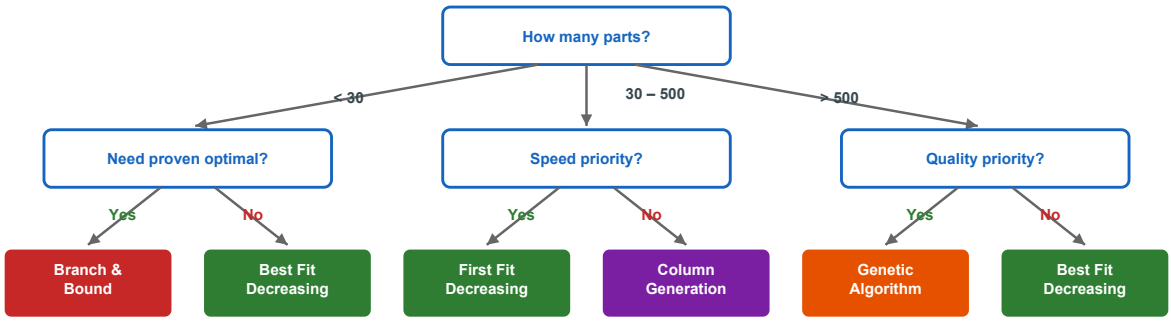
Seven algorithms are available, ranging from simple heuristics (instantaneous results) to exact solvers (guaranteed optimal but slower). The choice depends on job size, desired accuracy, and acceptable wait time.

6.1 Algorithm Quick Reference

Algorithm	Speed	Quality	Best For
First Fit	★★★★★	★★☆☆☆	Quick estimates; order-preserving when sequence matters
Best Fit	★★★★★	★★★☆☆	Quick estimates with slightly better packing than First Fit
First Fit Decreasing	★★★★★	★★★★☆	General-purpose; excellent balance of speed and quality
Best Fit Decreasing	★★★★★	★★★★☆	Best heuristic; tightest packing for most workloads
Column Generation	★★★☆☆	★★★★★	Large jobs (100-1000+ parts) where near-optimal matters
Branch and Bound	★☆☆☆☆	★★★★★	Small jobs (<50 parts) where proven optimality is required
Genetic Algorithm	★★★☆☆	★★★★☆	Large complex jobs; good alternative to Column Generation

6.2 Algorithm Decision Guide

Decision Guide — which algorithm should I use?



All decisions assume a single calculation. For interactive 'what-if' analysis, always prefer the heuristic algorithms (instantaneous results).

Branch & Bound has a configurable 15 s – 5 min time limit; falls back to best-found.
Advanced alternatives: Simulated Annealing (like Genetic) and Cutting Stock LP (like Column Generation).

6.3 Detailed Algorithm Descriptions

First Fit

`O(n × k) — n=parts, k=open bars`

How it works: Places each part (in input order) into the first bar that has enough remaining space. If no existing bar fits, a new bar is opened.

Advantages: Very fast. Preserves the original input order — useful when parts must be cut in a specific sequence.
Disadvantages: Typically produces more waste than decreasing algorithms because short parts may be placed early, leaving fragmented space.

Best Fit

`O(n × k)`

How it works: Like First Fit, but instead of using the FIRST bar with enough space, it selects the bar with the LEAST remaining space after placement.

Advantages: Better packing than First Fit because it minimises leftover space in each bar.
Disadvantages: Still processes parts in input order; pre-sorting would improve results further.

First Fit Decreasing (FFD)

`O(n log n) + O(n × k)`

How it works: Sorts all parts from longest to shortest, then applies First Fit. This single pre-processing step dramatically improves results.

Advantages: Provably within 11/9 of optimal + 6/9 in worst case. Extremely fast.
Disadvantages: Does not consider the global picture — purely greedy. Not optimal for all inputs.

Best Fit Decreasing (BFD)

`O(n log n) + O(n × k)`

How it works: Sorts parts longest-first, then applies Best Fit. Generally the best-performing heuristic.

Advantages: Same worst-case guarantee as FFD but often produces tighter packing in practice. Still instantaneous.
Disadvantages: Slightly slower than FFD (negligible in practice). Not guaranteed optimal.

Column Generation

`O(n × L × k) — L=max bar length`

How it works: Solves an exact bounded knapsack sub-problem (via dynamic programming) for each new bar, considering all remaining demand. Near-optimal on any size job.

Advantages: Produces excellent results even on 1000+ part jobs. Significantly better than heuristics for complex workloads.
Disadvantages: Slower than heuristics (seconds to minutes). Not guaranteed optimal in all edge cases.

Branch and Bound

`Exponential; configurable time limit`

How it works: Exact tree search. Seeds the upper bound from FFD, then systematically explores the solution space, pruning branches whose lower bound ≥ the current best known solution.

Advantages: Guarantees the minimum possible number of bars. Proves optimality.
Disadvantages: Exponential worst case. Only practical for small jobs. Use the time-limit slider (15s–5min) to cap execution.

Genetic Algorithm

`O(generations × population × n)`

How it works: Evolves a population of 200 part-permutation chromosomes over 300 generations. Each chromosome is decoded using FFD. Tournament selection, order crossover, and swap mutation drive evolution.

Advantages: Good results on large, complex workloads. Non-deterministic — can sometimes find solutions that deterministic algorithms miss.
Disadvantages: Results vary between runs (stochastic). Slower than heuristics. Not guaranteed optimal.

6.4 Branch and Bound — Time Limit Slider

When "Branch and Bound" is selected, a slider appears in the Controls Bar. This slider controls the maximum wall-clock time the algorithm is allowed to run:

Setting	Description
Minimum: 15 s	Quick search. Good for very small jobs (< 20 parts).
Default: 15 s	The algorithm starts here. Increase if the status message says time expired.
Maximum: 300 s (5 min)	Long search. For jobs where proven optimality is critical.
Tick interval: 15 s	The slider snaps to 15-second increments for easy selection.

TIME EXPIRED? If the algorithm runs out of time before proving optimality, it returns the best solution found so far (seeded from FFD). The status bar will indicate this. Increase the time limit and re-run if you need a better result.

7 Running a Calculation

7.1 Step-by-Step Procedure

1. Enter at least one stock bar in the Stock Bars grid (Section 4).
2. Enter at least one required part in the Required Parts grid (Section 5).
3. Set the Cutting Gap (mm) — your saw blade width plus kerf (default: 5 mm).
4. Select your preferred algorithm from the Nesting Method dropdown (Section 6).

5. If using Branch and Bound, set the time limit via the slider.
6. Click the "Calculate" button in the Controls Bar.
7. A "Calculating..." indicator appears while the engine works on a background thread.
8. When complete, the Cutting Patterns grid is populated with the optimized cut plans.
9. The Status Bar displays a summary: total bars used, waste %, total waste in mm.
10. You can now export the results (Section 9), adjust inputs, and re-calculate.

7.2 What Happens Internally

When you click Calculate, the following sequence occurs:

- All non-excluded parts are collected into a flat list (each part × its quantity).
- Excluded and rejected parts are collected separately for the export's rejected section.
- The selected algorithm receives the stock list, flat parts list, and cutting gap.
- The algorithm runs on a background thread — the UI remains responsive.
- The engine returns a NestingResult containing CuttingPattern objects.
- The UI thread updates the Results grid and Status Bar.

8 Understanding the Results

8.1 Cutting Patterns Grid Columns

Column	Description
#	Pattern index — a unique number identifying this cut layout. Patterns are numbered starting from 1.
Stock Bar (mm)	The length of the stock bar used for this particular pattern. If you have multiple stock types, different patterns may use different bar lengths.
Cutting Pattern	The sequence of part lengths cut from this bar. Displayed as: 2100 + 1500 + 800. The cutting gap is included internally but not shown in the display.
Remaining (mm)	The leftover material after all cuts and gaps. This is the off-cut — the unusable remnant.
Qty	How many bars should be cut in this exact pattern. If Qty = 3, you need three identical bars cut in this sequence.

8.2 Status Bar Summary

After a successful calculation, the status bar shows a message like:

> Done — 5 bar(s) used, 2.1% waste (630 mm total). ⚠ 2 part row(s) excluded.

This tells you: 5 stock bars are needed, 2.1% of the total material is wasted (630 mm across all bars), and 2 part rows were excluded from the calculation.

8.3 Reading a Cutting Pattern — Visual Example

Each pattern row can be visualised as a bar being cut into segments:

Pattern #1 (Qty: 1) — Stock 6000 mm

Stock = 6000 mm · Remaining = 290 mm

In this example, a 6000 mm bar is cut into three parts: 2100 + 2100 + 1500. Two 5 mm cutting gaps consume 10 mm. The remaining off-cut is 290 mm (coloured red with dashed border). The dark narrow strips between parts represent the cutting gap.

Pattern #2 (Qty: 1) — Stock 6000 mm

Stock = 6000 mm · Remaining = 475 mm

This bar packs one 1500 mm and five 800 mm parts. Five gaps (25 mm total). Remaining: 475 mm.

Pattern #3 (Qty: 2) — Stock 3000 mm

Stock = 3000 mm · Remaining = 980 mm

Two copies of this pattern are needed (Qty: 2). Each 3000 mm bar produces four 500 mm parts with 980 mm remaining.

9 Export Options

Results can be exported in three formats. All formats use the currently selected language for headers, labels, and rejection reasons. Access all three from the Results menu.

9.1 Export Format Comparison

Format	File	Features
CSV	.csv	Universal text format. Comma-separated. UTF-8 encoded. Importable by Excel, Google Sheets, databases, or any text editor.
Excel	.xlsx	Formatted ClosedXML workbook. Blue header row, alternating row shading, auto-fit columns. Rejected parts section with red formatting. RTL support for Arabic.
PDF	.pdf	Professional A4 report. Summary cards (bars used, waste, waste %), formatted cutting patterns table, rejected parts section, page numbers, and copyright footer.

9.2 What Is Included in Each Export

- Cutting Patterns table — all columns: #, Stock Bar, Pattern, Remaining, Qty
- Summary block — Total Bars Used, Total Waste (mm), Waste %
- Rejected/Excluded parts section (if any) — Length, Quantity, Reason (translated)
- All text is translated to the currently selected language

9.3 Exporting — Step by Step

1. Run a calculation first (the Export menu items are greyed out until results exist).
2. Click Results in the menu bar.
3. Choose your format: Export to CSV, Export to Excel, or Export to PDF.
4. A Save dialog opens. Choose your destination folder and filename.
5. Click Save. The status bar confirms: "Exported to filename.ext."

10 Saving & Loading Projects

10.1 Project File Format

Projects are saved with the extension .1Dnest. This is a JSON file containing all input data:

- All stock bar entries (length, quantity/unlimited)
- All part entries (length, quantity)
- Selected algorithm name
- Cutting gap value

IMPORTANT Results (cutting patterns) are NOT saved in the project file — only inputs. After loading a project, re-run the calculation to regenerate results. This ensures results always match the current algorithm and inputs.

10.2 Saving a Project

1. Click File → Save Project… (or Alt+F, S).
2. A Save dialog opens with the .1Dnest filter.
3. Choose a location, enter a filename, and click Save.
4. Status bar confirms: "Project saved to filename.1Dnest."

10.3 Loading a Project

1. Click File → Load Project… (or Alt+F, L).
2. An Open dialog appears with the .1Dnest filter.
3. Select your project file and click Open.
4. All stock bars and parts are loaded. The algorithm and cutting gap are restored.
5. Run Calculate to regenerate results.

11 Themes & Visual Settings

Four colour themes are available from the Theme dropdown in the toolbar. Themes switch instantly with no restart required. Your choice is persisted across sessions.

Light	Midnight	Ocean	Forest
Clean white Blue accents	Deep navy Violet accents	Ocean blue Cyan accents	Dark green Green accents

Every UI element respects the theme: window background, data grid rows, column headers, buttons, text, borders, menus, and status bar. Themes do not affect export output (exports always use a fixed professional colour scheme).

12 Language Selection

The application supports eight languages. Changing the language instantly updates ALL user-facing text: window title, menus, buttons, labels, column headers, algorithm descriptions, tooltips, status messages, and export file content.

Language	Native Name	Direction	Notes
English	English	LTR	Default language. UK flag icon.
Arabic	العربية	RTL	Egypt flag. Full right-to-left layout including window, grids, and buttons.
Greek	Ελληνικά	LTR	Greece flag. Full Unicode support for polytonic characters.
Dutch	Nederlands	LTR	Netherlands flag.
French	Français	LTR	France flag.
Russian	Русский	LTR	Russia flag. Cyrillic character support.
Japanese	日本語	LTR	Japan flag. CJK character support.
Italian	Italiano	LTR	Italy flag.

RTL NOTE When Arabic is selected, the entire window flips to right-to-left: menus appear on the right, grids flow right-to-left, and buttons reverse position. This matches native Arabic reading direction.

13 Session Persistence

The following settings are automatically saved whenever they change and restored on next launch:

Setting	What Is Saved	Trigger
Theme	Theme name (Light/Midnight/Ocean/Forest)	On theme change
Language	Language code (en/ar/el/nl/fr/ru/ja/it)	On language change
Window Width	Window width in pixels	On resize
Window Height	Window height in pixels	On resize
Window State	Normal or Maximized	On state change

Settings are stored as JSON at: %APPDATA%_1D_NestingCalculator\settings.json

```
{
  "ThemeName"    : "Midnight",
  "LanguageCode" : "en",
  "WindowWidth"  : 1100,
  "WindowHeight" : 780,
  "WindowState"  : "Normal"
}
```

14 Sample Project 1 — Steel Rebar Cutting

A construction site needs rebar cut to various lengths from standard 12-metre bars. This example walks through the complete workflow.

14.1 Input Data — Stock Bars

Length (mm)	Quantity	Unlimited
12000	—	✓ Yes

14.2 Input Data — Required Parts

Length (mm)	Quantity	Purpose
3200	8	Column reinforcement
2500	12	Beam stirrups
1800	20	Slab reinforcement
900	15	Lintel reinforcement
450	30	Tie bars

14.3 Settings

- Cutting Gap: 3 mm (band saw)
- Algorithm: Best Fit Decreasing

14.4 Expected Results

After clicking Calculate, the engine produces cutting patterns like:

Pattern #1 (Qty: 2) — 12000 mm bar

Stock = 12000 mm · Remaining = 588 mm

Pattern #2 — packed tightly

Stock = 12000 mm · Remaining = -512 mm

Pattern #3 (Qty: 1) — six 1800 mm pieces

Stock = 12000 mm · Remaining = 12 mm

Pattern #4 — short pieces packed

Stock = 12000 mm · Remaining = 967 mm

RESULT SUMMARY Typical output: 8-10 bars used. Waste: 2-4%. All 85 parts produced. With manual planning, this job would typically require 12+ bars.

15 Sample Project 2 — Aluminium Window Frames

A window manufacturer needs aluminium extrusion profiles cut for a batch of 10 standard windows. Multiple stock lengths are available from the supplier.

15.1 Stock Bars — Multiple Lengths

Length (mm)	Quantity	Unlimited
6500	—	✓ Yes (standard length)
4000	20	Short stock (limited)

15.2 Required Parts — Window Components

Length (mm)	Qty	Component
1200	20	Top/bottom frame rail (10 windows × 2)
1500	20	Left/right frame stile (10 windows × 2)
1150	10	Sash rail
700	10	Mullion
580	20	Glazing bead — horizontal
420	20	Glazing bead — vertical

15.3 Settings & Results

- Cutting Gap: 4 mm (cold saw)
- Algorithm: Column Generation (100 parts → need quality)

Expected result: approximately 15-18 stock bars used, waste under 3%. The Column Generation algorithm will likely prefer the 6500 mm bars for most patterns, using the 4000 mm bars only when they provide a better fit for remaining shorter parts.

MULTI-STOCK BENEFIT Using two stock lengths (6500 + 4000) instead of just one typically reduces waste by 1-3% because shorter bars can be used when leftover space on a 6500 mm bar would be wasted.

16 Sample Project 3 — Copper Pipe Installation

A plumbing contractor needs copper pipes cut for a residential installation. This demonstrates the Exclude feature and Excel import.

16.1 Stock: 3000 mm copper pipes (unlimited supply)

16.2 Parts (imported from Excel)

Length (mm)	Qty	Purpose
2400	4	Main hot/cold risers
1200	8	Branch lines
800	12	Fixture connections
350	16	Short connectors
5000	2	Outdoor extension (EXCEEDS STOCK!)

The 5000 mm parts exceed the 3000 mm stock. They appear as RED ROWS and are automatically excluded. The plumber can order longer stock or source these separately.

16.3 Scenario Analysis — Using Exclude

The contractor wants to see what happens if the fixture connections are deferred to Phase 2:

1. Check the Exclude box on the 800 mm × 12 row.
2. Click Calculate again.
3. The status bar shows: "Done — N bar(s) used... ⚠ 1 part row(s) excluded."
4. Compare the two results to decide whether to include Phase 2 parts in this order.

17 Frequently Asked Questions

Q: What happens if I have no stock bars and click Calculate?

The engine requires at least one stock bar and one included part. The status bar will show an error message.

Q: Can I use decimal lengths like 1500.5 mm?

Yes. All length fields accept decimal values. The cutting gap also accepts decimals (e.g., 3.2 mm).

Q: Why does my part show in red?

The part length exceeds the longest available stock bar. Either add a longer stock bar or reduce the part length.

Q: Can I change the algorithm after calculating and re-run?

Yes. Simply select a different algorithm and click Calculate again. The previous results are replaced immediately.

Q: Are my settings saved when I close the app?

Yes. Theme, language, and window size are saved automatically to %APPDATA%_1D_NestingCalculator\settings.json. On next launch, everything is restored.

Q: Can I use the app offline?

Yes. The application is entirely offline — no internet connection is required for any feature.

Q: What is the maximum number of parts I can enter?

There is no hard limit. The heuristic algorithms handle 10,000+ parts easily. Branch and Bound is practical only for < 50 parts. Column Generation and Genetic Algorithm work well up to ~2000 parts.

Q: Can I undo a calculation?

There is no undo button for calculations, but your input data is never modified. Simply adjust inputs and re-calculate. To restore a previous state, load a saved .1Dnest project file.

18 Troubleshooting

Symptom	Resolution
Status: "Add parts before calculating."	You have no parts, or all parts are excluded. Add at least one non-excluded part.
Status: "Error: No stock bar available for part of length X mm."	Add a stock bar whose length ≥ the longest part length.
Export menu items are greyed out	Run a calculation first. Export is only available after results exist.
App closes immediately after splash	This was a known issue — fixed in v1.0. Ensure you have the latest build.
Column headers don't change language	This was a known issue — fixed by using TextBlock-in-Header pattern.
Excel import reports "No valid rows found"	Ensure Column A contains numeric lengths and Column B contains numeric quantities. Non-numeric header rows are skipped automatically.

19 Glossary

Term	Definition
1D Nesting	The problem of cutting one-dimensional stock material into required pieces with minimum waste. Also called the Cutting Stock Problem.
Bin Packing	The general optimisation problem of fitting items into containers (bins). 1D nesting is a special case.
Cutting Gap / Kerf	The width of material destroyed by each saw cut. Must be accounted for to avoid under-sized parts.
FFD / BFD	First Fit Decreasing / Best Fit Decreasing — greedy heuristic algorithms that sort parts longest-first.
Off-cut / Remnant	The leftover material at the end of a stock bar after all parts and gaps are cut. This is waste.
Cutting Pattern	A specific arrangement of parts on one stock bar. Multiple bars may share the same pattern (Qty > 1).
NestingResult	The internal data structure containing all cutting patterns, summary statistics, and metadata.
DynamicResource	A WPF XAML binding that re-evaluates when its source changes — used for theme and language switching.