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English | □□

□□□ `tools/pre-execute` waterfall□□ `tools/execute` □ `tools/post-execute` waterfall□□□ water `finalizeContent` □□□□□□ `tools/result` □□□□□□□

```
flowchart TD
  model["Assistant message contains tool-call block"]
  toolCall["Session event: <code>tool/call</code><br/>logged before execution"]
  presentCall["UI pending card<br/>presentCall(args)"]
  pre["<code>tools/pre-execute</code> waterfall<br/>hooks, permission, sandbox"]
  guards["Registered monotonic guards<br/>deny or abstain; identity protected"]
  denied["denied or approval refused<br/>tool body skipped"]
  approval["<code>ctx.approval</code> one-shot prompt<br/>absent or unanswerable: deny"]
  around["<code>tools/execute</code> waterfall<br/>timeout, retry, metrics (around dispatch)"]
  toolBody["Registered tool execute() body"]
  fsGate["<code>fs/write-intent</code> or <code>fs/edit-intent</code><br/>tool-fs mutations only"]
  owned["Tool-owned session events<br/><code>todo/write</code>, <code>fs/observed</code>,
<code>hook/invoked</code>, <code>hook/result</code>, <code>tool/code-dispatch</code>"]
  post["<code>tools/post-execute</code> waterfall<br/>accept, block, replace, add context"]
  normalized["Registry outer normalization<br/>pipeline/result snapshot throws become isError"]
  finalize["ToolDefinition.finalizeContent<br/>last content-only invariant"]
  final["<code>tools/result</code> synchronous notification<br/>frozen authoritative outcome"]
  context["Active-batch additionalContexts FIFO<br/>injected user/message after recorded tool results"]
  toolResult["Session event: <code>tool/result</code><br/>single model-facing outcome"]
  allResults["Tool batch settled<br/>recorded tool/result events complete"]
  presentResult["UI completed card<br/>presentResult(args, result)"]
  model --> toolCall
  toolCall --> presentCall
  toolCall --> pre
  pre -->|allow| guards
  guards -->|allow| around
  guards -->|deny| denied
  guards -.->|throw| normalized
  around --> toolBody
  pre -->|deny| denied
```

```
pre -->|ask| approval
approval -->|allowed-once| guards
approval -->|rejected, cancelled, unavailable| denied
approval -.->|throw| normalized
denied --> post
pre -.->|throw| normalized
toolBody --> fsGate
fsGate --> toolBody
toolBody --> owned
toolBody --> around
around --> post
around -.->|wrapper throws| normalized
post -.->|throw| normalized
post --> finalize
normalized --> finalize
finalize --> final
final --> toolResult
toolResult --> presentResult
toolResult --> allResults
allResults --> context
```

[tool-fs □[fs/*]□□□□□□□□□□□ ctx.approval |[tools/execute □[finalizeContent] tools/result □□□□□□□□□□□□