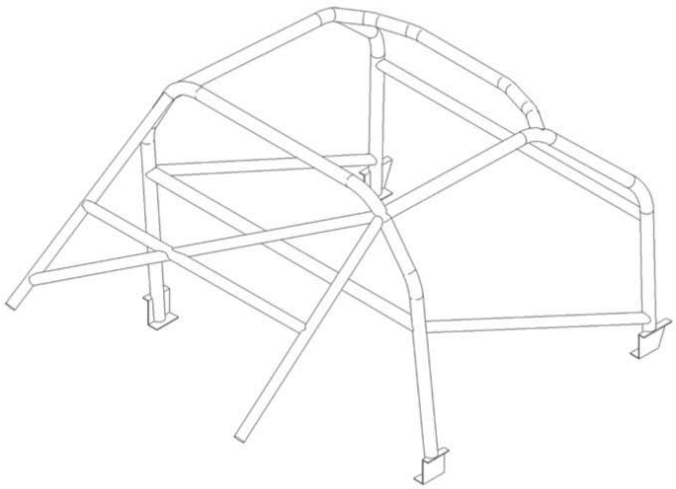
ENGINEERING SPECIFICATION DOCUMENT

EF/EK Civic Time Attack Program
Safety, 12-Point Cage, Seating & Fire System Specification



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Contents

1 Purpose

This document defines the **complete safety system** for the EF/EK Civic AWD time attack build, with a focus on a **12-point, full-chassis roll cage** integrated into the:

- Passenger cell (main hoop, A-pillars, roof),
- Front structure (sills, dash bar, tower tie-ins),
- Rear structure (rear stays, rear shock towers),
- **Underbody and AWD rear differential cradle**.

It also specifies:

- FIA-style seat mounting,
- 6-point (or higher) harness geometry,
- Fire suppression system,
- Electrical kill switch and basic rescue provisions.

2 Safety System Overview

2.1 Intent

- Provide **rollover and intrusion protection** exceeding typical 6-point cages.
- Stiffen the chassis by tying the cage into:
  - Front suspension region,
  - Rear shock towers,
  - AWD rear diff cradle and rear subframe.
- Create a **continuous load path** from aero and suspension loads into the safety cell.

2.2 Systems Included

- 12-point roll cage structure.
- Seat mounting system (FIA seat).
- 6-point harness system.
- Fire suppression system.
- External and internal kill switches.
- Window net and basic driver extraction provisions.

3 Cage Concept: 12-Point Layout

3.1 Definition of "12 Points"

For this project, the 12 primary cage attachment points are defined as:

P1 Main hoop left foot (driver side floor/sill).
P2 Main hoop right foot (passenger side floor/sill).
P3 A-pillar left foot (driver side).
P4 A-pillar right foot (passenger side).
P5 Rear stay left mount (rear shock tower / rear rail).
P6 Rear stay right mount (rear shock tower / rear rail).

P7 Left sill bar tie-in (forward of main hoop).
P8 Right sill bar tie-in (forward of main hoop).
P9 Front tower / front rail tie-in (left).
P10 Front tower / front rail tie-in (right).
P11 Rear lower cross-tube tie-in at rear subframe / cradle (left).
P12 Rear lower cross-tube tie-in at rear subframe / cradle (right).

3.2 Additional Non-Counted Tubes

Beyond the "12 points", the cage may include:

- Roof diagonal or X.
- Main hoop diagonal or X.
- Door X-bars or NASCAR-style bars.
- Dash bar.
- Harness bar.
- Gussets and node reinforcement plates.

These do not add new *floor* points, but significantly increase stiffness and strength.

4 Material and Tube Specifications

4.1 Material

- **Preferred:** 1.50" x 0.095" DOM mild steel (1018/1020).
- **Alternative:** 1.50" x 0.083" 4130 chromoly (TIG welded only).

4.2 Tube Sizing Guidelines

Tube Location	Diameter x Wall	Notes
Main hoop	1.50" x 0.095" DOM	Primary rollover structure
A-pillars / front legs	1.50" x 0.095" DOM	From halo to floor plates
Roof bars / halo	1.50" x 0.095" DOM	Roof perimeter
Door bars	1.50" x 0.095" DOM	X or NASCAR style
Rear stays	1.50" x 0.095" DOM	To rear towers/rails
Sill bars	1.25"–1.50" x 0.083"–0.095" DOM	Tie front and main hoop
Lower rear cross tube	1.50" x 0.095" DOM	To diff cradle/subframe
Tower tie-ins	1.25"–1.50" x 0.083" DOM	Triangulation tubes

Table 1: Recommended tube sizes.

5 Mounting Plates and Load Paths

5.1 Floor / Sill Plates

- Minimum thickness: 3 mm (1/8").
- Minimum area: 20 cm^2 per point, larger where possible.
- Plates to be:
  - Formed to match floor contour where needed,
  - 360° welded to floor or sill,
  - Backed with doubler plates if sheetmetal is thin.

5.2 Rear Shock Tower / Rail Plates

- Plates contoured to shock tower curvature.
- Welded onto tower and adjacent structure (rail or inner arch).

5.3 Diff Cradle / Rear Subframe Tie-In

- Lower rear cross-tube connects between left and right chassis rails near diff cradle mounts.
- Vertical/diagonal tubes from main hoop node to this cross-tube create a triangle:
  - Main hoop node,
  - Rear stay node,
  - Lower diff cradle node.
- This creates a rigid load path between:
  - Rear suspension,
  - Rear diff cradle,
  - Safety cell.

6 Cage Geometry

6.1 Main Hoop

- Located directly behind seats.
- As close as practical to B-pillar and roof.
- Must allow helmet clearance of at least 50 mm.

6.2 Front Section (A-Pillars and Halo)

- A-pillar legs follow windshield frame and door aperture.
- Halo or front hoop across the roof, connecting A-pillars.
- Dash bar may pass through or in front of dash (trim as required).

6.3 Roof and Main Hoop Diagonals

- At minimum, one roof diagonal.
- Main hoop:
  - Single diagonal or X-brace behind driver for strength.

6.4 Door Bars

- Double-X or NASCAR style bars on driver side recommended.
- Passenger side may be similar or simplified X.
- Bars should intersect at nodes for proper load transfer.

6.5 Sill Bars

- Run between A-pillar feet and main hoop feet along sill / rocker area.
- Increase side impact protection and chassis stiffness.

7 Front and Rear Structure Integration

7.1 Front Tower / Rail Tie-Ins

- Tubes from A-pillar feet or dash bar nodes to:
  - Front frame rails, or
  - Front strut towers (if permitted by rules).
- Goal: transfer suspension loads into cage for stiffness.

7.2 Rear Shock Towers and Diff Cradle

- Rear stays tie main hoop to rear shock towers.
- Additional lower cross-tube between left/right rails near diff cradle.
- Optionally, short tubes from lower cross-tube to diff cradle mount points (bolt-on cradle).

8 Welding, Fabrication, and Inspection

8.1 Welding Process

- MIG acceptable for DOM cages.
- TIG recommended for chromoly cages (and some rulebooks require heat treatment considerations).

8.2 Weld Quality

- Full penetration, no undercutting.
- Continuous welds around entire tube circumference where accessible.

8.3 Inspection

- Visual inspection of all nodes prior to paint.
- Confirm no sealed tubes without vent holes (to avoid pressure issues while welding).

9 Seat Mounting System

9.1 Seat Type

- FIA 8855-1999 or newer homologation.
- Fixed-back, side-mount competition seat.

9.2 Mounting Points

- Side mounts to:
  - Welded cross-tubes between sill and tunnel, **or**
  - Reinforced floor plates with through-bolted hardware.
- Minimum 8.8 hardware, preferably 10.9 for mounts.

9.3 Positioning

- Driver eye line centered vertically in windshield zone.
- Seat recline adjusted to:
  - Align harness angles,
  - Maintain comfortable pedal reach.

10 Harness System

10.1 Harness Specification

- 6-point FIA harness minimum.
- 2" shoulder straps with HANS compatibility preferred.

10.2 Harness Bar Geometry

- Harness bar welded between main hoop uprights.
- Shoulder belts angle: 0° to –20° downward from shoulder line.

10.3 Sub-Strap and Lap Belt Mounting

- Sub-straps pass through seat openings and anchor to reinforced floor or cross-tubes.
- Lap belts anchored near seat base, pulling at 45° angle relative to seat base plane.

11 Fire Suppression System

11.1 System Type and Size

- 2.25–4.0 L AFFF or Novec-type plumbed-in system.
- Manual cable pull and/or electric trigger.

11.2 Nozzle Layout

- Engine bay: minimum 2 nozzles.
- Cabin: 1–2 nozzles aimed at:
  - Driver footwell,
  - Tunnel and fuel line area.

11.3 Bottle Mounting

- Mounted low and central, ideally on passenger side floor.
- Use manufacturer-supplied brackets and dual straps.

12 Electrical Kill Switch

12.1 Function

- Kill switch must:
  - Cut battery power to main bus,
  - Interrupt alternator field/excitation,
  - Drop ECU power.

12.2 Placement

- External: accessible from outside (cowl base, A-pillar area, or wiper cowl).
- Internal: reachable by driver while harnessed.

13 Window Net and Driver Extraction

13.1 Window Net

- FIA/SFI-approved net mounted to cage.
- Quick-release mechanism at top or front.

13.2 Driver Extraction Considerations

- Steering wheel quick release mandatory.
- Door opening must allow helmet and HANS to exit.
- Harness, net, and wheel removal sequence should allow exit within 10 seconds.

14 Paint and Corrosion Protection

- Clean all welds and tubes to bare metal.
- Use epoxy primer then 2K topcoat.
- Avoid heavy filler or seam sealer on weld toes (so cracks are visible).

15 Future Revisions

- Add CAD tube cut list and bend angles.
- Add integration details for roof skin / dash modifications.
- Add photos of completed cage with node callouts.
- Cross-reference with diff cradle and AWD chassis documents.