```
In [6]: import sys
         import os
         import warnings
         warnings.filterwarnings("ignore")
         sys.path.append(os.path.abspath('Sources'))
         import about_ml_models as mlm
```

```
In [24]:  #falla =True -> para obtener datos con fallas estructurales
          #falla =False -> para obtener datos sin fallas estructurales
          #falla =None -> selección aleatoria de los datos

          data_IM, X_new_scaled=mlm.get_seismic_signals(falla=True)
```

Seismic Response - E2_P2_B_CF3_1
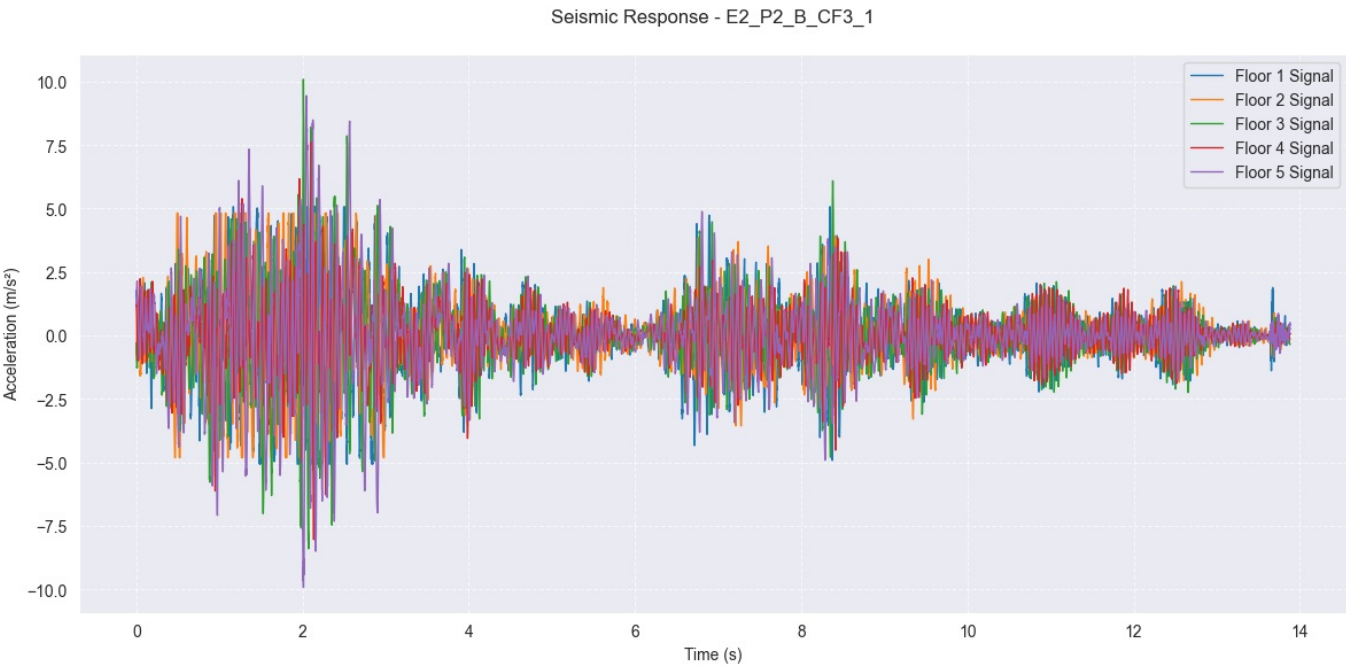

```
================================================================================
SEISMIC SIGNAL REPORT
================================================================================

GENERAL INFORMATION:
--------------------------------------------------
Signal ID: E2_P2_B_CF3_1
Structure E2: 6 columns, 5 levels
Earthquake B: Cape Mendocino, 4/25/1992, Northern California
Damage Status: Damaged
Damage Location: Floor 2
Damage Severity: Level 1
--------------------------------------------------

INTENSITY MEASURES BY FLOOR:
--------------------------------------------------
```

IM	Description	Floor 1	Floor 2	Floor 3	Floor 4	Floor 5
PGA	Peak Ground Acceleration	4.7003	4.2085	6.2529	4.5195	7.2631
PGV	Peak Ground Velocity	0.1932	0.3996	0.2126	0.2058	0.2702
IA	Arias Intensity	2.3636	2.5683	2.568	1.3598	3.7756
CAV	Cumulative Absolute Velocity	9.7294	10.2294	9.9608	7.576	11.6539
RMS	Root Mean Square Acceleration	0.9921	1.0341	1.0341	0.7525	1.2538
DS	Significant Duration	8.908	9.392	8.899	10.127	8.296
FP	Predominant Frequency	11.7188	15.625	11.7188	15.625	11.7188
IH	Housner Intensity	0.4269	3.7158	0.4648	0.456	0.5566
ET	Time Energy	14.7615	16.0398	16.0381	8.4924	23.5801
EWT	Wavelet Energy Total	17095.6	16288.1	17775.6	8631.79	29989.6

```
In [25]:  # Load models
          models_det = mlm.load_models()
```

```python
# Make predictions
results, consensus = mlm.predict_damage(X_new_scaled, models_det)
```

```
================================================================================
STRUCTURAL DAMAGE PREDICTION REPORT
================================================================================


Random Forest [1] 100.00%
XGBoost [1] 99.05%
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 118ms/step
Neural Network [1] 99.90%
MODEL PREDICTIONS:
--------------------------------------------------
+----------------+--------------+----------------------+
| Model          | Prediction   | Damage Probability   |
+================+==============+======================+
| Random Forest  | Damaged      | 100.00%              |
+----------------+--------------+----------------------+
| XGBoost        | Damaged      | 99.05%               |
+----------------+--------------+----------------------+
| Neural Network | Damaged      | 99.90%               |
+----------------+--------------+----------------------+


CONSENSUS ANALYSIS:
--------------------------------------------------
Model Agreement: 100%
Final Assessment: HIGH PROBABILITY OF DAMAGE
--------------------------------------------------
```

In [26]:
```python
# damage location prediction
if consensus>0.5:
    mlm.ubicar_falla(data_IM)
```

```
================================================================================
STRUCTURAL DAMAGE LOCATION PREDICTION REPORT
================================================================================


1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 107ms/step
[[8.7670131e-05 9.9990714e-01 4.8955208e-05 1.1685326e-04]]
1
MODEL PREDICTIONS:
--------------------------------------------------
+----------------+----------------------+--------------+
| Model          | Predicted Location   | Confidence   |
+================+======================+==============+
| Random Forest  | Floor 2              | 97.00%       |
+----------------+----------------------+--------------+
| XGBoost        | Floor 2              | 99.22%       |
+----------------+----------------------+--------------+
| Neural Network | Floor 2              | 99.99%       |
+----------------+----------------------+--------------+


DETAILED PROBABILITY ANALYSIS:
--------------------------------------------------
+----------------+-----------+-----------+-----------+-----------+
| Model          | Floor 1   | Floor 2   | Floor 3   | Floor 4   |
+================+===========+===========+===========+===========+
| Random Forest  | 2.00%     | 97.00%    | 1.00%     | 0.00%     |
+----------------+-----------+-----------+-----------+-----------+
| XGBoost        | 0.42%     | 99.22%    | 0.21%     | 0.16%     |
+----------------+-----------+-----------+-----------+-----------+
| Neural Network | 0.01%     | 99.99%    | 0.00%     | 0.01%     |
+----------------+-----------+-----------+-----------+-----------+


CONSENSUS ANALYSIS:
--------------------------------------------------
Model Agreement: 100%
Final Assessment: HIGH CONFIDENCE: Floor 2

Prediction Distribution:
Floor 1: 0/3 models
Floor 2: 3/3 models
Floor 3: 0/3 models
Floor 4: 0/3 models
--------------------------------------------------
```

In [ ]:

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