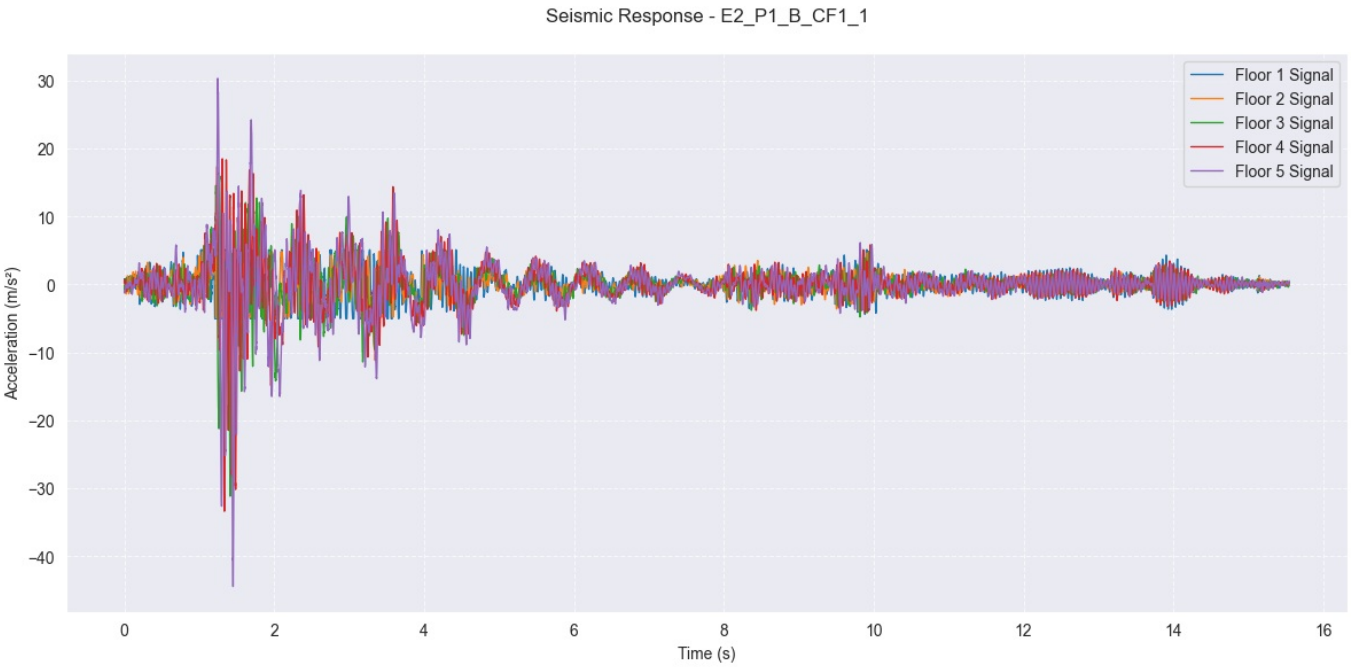
In [6]:
```
import sys
import os
import warnings
warnings.filterwarnings("ignore")
sys.path.append(os.path.abspath('Sources'))
import about_ml_models as mlm
```

In [7]:
```
#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 SIGNAL REPORT
================================================================================

GENERAL INFORMATION:
--------------------------------------------------
Signal ID: E2_P1_B_CF1_1
Structure E2: 6 columns, 5 levels
Earthquake B: Cape Mendocino, 4/25/1992, Northern California
Damage Status: Damaged
Damage Location: Floor 1
Damage Severity: Level 0
--------------------------------------------------

INTENSITY MEASURES BY FLOOR:
--------------------------------------------------
+------+--------------------------------+------------+------------+------------+------------+------------+
| IM   | Description                    |    Floor 1 |    Floor 2 |    Floor 3 |    Floor 4 |    Floor 5 |
+======+================================+============+============+============+============+============+
| PGA  | Peak Ground Acceleration       |     4.8536 |     4.8147 |    19.5458 |    18.2547 |    28.776  |
+------+--------------------------------+------------+------------+------------+------------+------------+
| PGV  | Peak Ground Velocity           |     0.5751 |     0.5614 |     0.7508 |     0.8865 |     1.3967 |
+------+--------------------------------+------------+------------+------------+------------+------------+
| IA   | Arias Intensity                |     3.3085 |     4.3776 |    10.6187 |    12.019  |    23.4189 |
+------+--------------------------------+------------+------------+------------+------------+------------+
| CAV  | Cumulative Absolute Velocity   |    11.6145 |    13.147  |    17.2669 |    19.5508 |    25.3089 |
+------+--------------------------------+------------+------------+------------+------------+------------+
| RMS  | Root Mean Square Acceleration  |     1.1737 |     1.3501 |     2.1027 |     2.2371 |     3.1227 |
+------+--------------------------------+------------+------------+------------+------------+------------+
| DS   | Significant Duration           |     9.017  |     8.2    |     4.809  |     4.882  |     4.484  |
+------+--------------------------------+------------+------------+------------+------------+------------+
| FP   | Predominant Frequency          |    11.7188 |     7.8125 |     7.8125 |     3.9062 |     7.8125 |
+------+--------------------------------+------------+------------+------------+------------+------------+
| IH   | Housner Intensity              |     3.4975 |     3.3128 |     1.7751 |     2.0319 |     2.2089 |
+------+--------------------------------+------------+------------+------------+------------+------------+
| ET   | Time Energy                    |    20.6626 |    27.3391 |    66.3163 |    75.0616 |   146.257  |
+------+--------------------------------+------------+------------+------------+------------+------------+
| EWT  | Wavelet Energy Total           | 20697.2    | 27377.4    | 66427.8    | 75346.5    | 147737     |
+------+--------------------------------+------------+------------+------------+------------+------------+
```

In [8]:
```
# Load models
models_det = mlm.load_models()
```

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

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

Random Forest [1] 97.00%
XGBoost [1] 99.03%
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 90ms/step
Neural Network [1] 99.91%
MODEL PREDICTIONS:
------------------------------------------------
+----------------+--------------+----------------------+
| Model          | Prediction   | Damage Probability   |
+================+==============+======================+
| Random Forest  | Damaged      | 97.00%               |
+----------------+--------------+----------------------+
| XGBoost        | Damaged      | 99.03%               |
+----------------+--------------+----------------------+
| Neural Network | Damaged      | 99.91%               |
+----------------+--------------+----------------------+


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

In [9]:
```
# damage location prediction
if consensus>0.5:
    mlm.ubicar_falla(data_IM)
```

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

1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 89ms/step
[[9.9287522e-01 1.6866000e-04 1.0640698e-06 4.6682358e-04]]
0
MODEL PREDICTIONS:
------------------------------------------------
+----------------+----------------------+--------------+
| Model          | Predicted Location   | Confidence   |
+================+======================+==============+
| Random Forest  | Floor 1              | 91.00%       |
+----------------+----------------------+--------------+
| XGBoost        | Floor 1              | 97.67%       |
+----------------+----------------------+--------------+
| Neural Network | Floor 1              | 99.29%       |
+----------------+----------------------+--------------+


DETAILED PROBABILITY ANALYSIS:
------------------------------------------------
+----------------+-----------+-----------+-----------+-----------+
| Model          | Floor 1   | Floor 2   | Floor 3   | Floor 4   |
+================+===========+===========+===========+===========+
| Random Forest  | 91.00%    | 8.00%     | 0.00%     | 1.00%     |
+----------------+-----------+-----------+-----------+-----------+
| XGBoost        | 97.67%    | 1.73%     | 0.20%     | 0.39%     |
+----------------+-----------+-----------+-----------+-----------+
| Neural Network | 99.29%    | 0.02%     | 0.00%     | 0.05%     |
+----------------+-----------+-----------+-----------+-----------+


CONSENSUS ANALYSIS:
------------------------------------------------
Model Agreement: 100%
Final Assessment: HIGH CONFIDENCE: Floor 1

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

In [ ]: