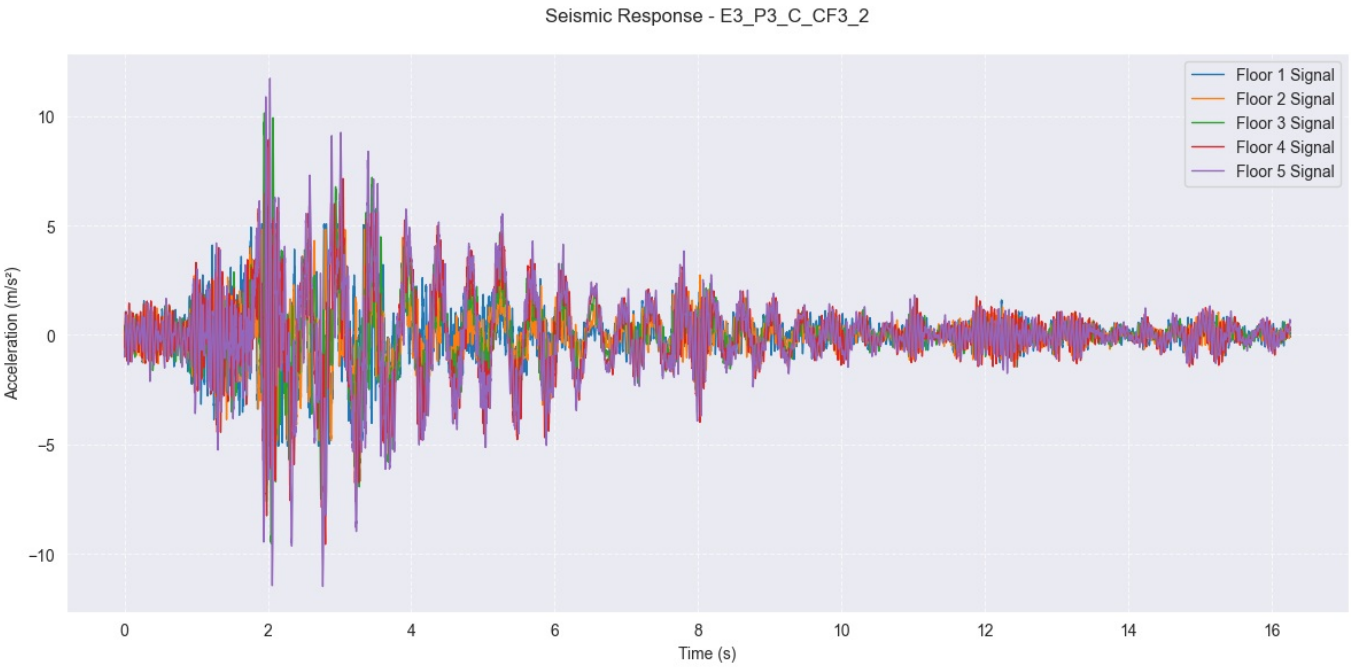
In [6]:
```
import sys
import os
import warnings
warnings.filterwarnings("ignore")
sys.path.append(os.path.abspath('Sources'))
import about_ml_models as mlm
```

In [16]:
```
#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: E3_P3_C_CF3_2
Structure E3: 8 columns, 5 levels
Earthquake C: Imperial Valley, 10/15/1979, El Centro
Damage Status: Damaged
Damage Location: Floor 3
Damage Severity: Level 1
--------------------------------------------------

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

IM	Description	Floor 1	Floor 2	Floor 3	Floor 4	Floor 5
PGA	Peak Ground Acceleration	4.4847	4.7631	5.8169	6.1463	8.6811
PGV	Peak Ground Velocity	0.333	0.3746	0.328	0.3748	0.4519
IA	Arias Intensity	1.2225	1.7217	3.1213	4.4774	6.5864
CAV	Cumulative Absolute Velocity	5.9971	7.6688	10.6382	13.134	15.4535
RMS	Root Mean Square Acceleration	0.7135	0.8467	1.14	1.3654	1.656
DS	Significant Duration	4.651	5.53	5.391	5.533	5.411
FP	Predominant Frequency	7.8125	7.8125	3.9062	3.9062	3.9062
IH	Housner Intensity	1.9276	1.8098	0.7274	0.876	1.024
ET	Time Energy	7.6351	10.7526	19.4936	27.9623	41.1336
EWT	Wavelet Energy Total	7641.94	11108.1	19657.7	28449.1	41522.5

In [17]:
```
# 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] 91.00%
XGBoost [1] 99.29%
WARNING:tensorflow:6 out of the last 6 calls to <function TensorFlowTrainer.make_predict_function.<locals>.one_s
tep_on_data_distributed at 0x0000024C8606FEC0> triggered tf.function retracing. Tracing is expensive and the exc
essive number of tracings could be due to (1) creating @tf.function repeatedly in a loop, (2) passing tensors wi
th different shapes, (3) passing Python objects instead of tensors. For (1), please define your @tf.function out
side of the loop. For (2), @tf.function has reduce_retracing=True option that can avoid unnecessary retracing. F
or (3), please refer to https://www.tensorflow.org/guide/function#controlling_retracing and https://www.tensorfl
ow.org/api_docs/python/tf/function for  more details.
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 113ms/step
Neural Network [1] 99.87%
MODEL PREDICTIONS:
--------------------------------------------------
+----------------+--------------+----------------------+
| Model          | Prediction   | Damage Probability   |
+================+==============+======================+
| Random Forest  | Damaged      | 91.00%               |
+----------------+--------------+----------------------+
| XGBoost        | Damaged      | 99.29%               |
+----------------+--------------+----------------------+
| Neural Network | Damaged      | 99.87%               |
+----------------+--------------+----------------------+


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

In [18]:
```
# damage location prediction
if consensus>0.5:
    mlm.ubicar_falla(data_IM)
```

```
================================================================================
STRUCTURAL DAMAGE LOCATION PREDICTION REPORT
================================================================================
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 85ms/step
[[0.01278999 0.00598832 0.9146153  0.01977865]]
2
MODEL PREDICTIONS:
--------------------------------------------------
+----------------+----------------------+--------------+
| Model          | Predicted Location   | Confidence   |
+================+======================+==============+
| Random Forest  | Floor 3              | 98.00%       |
+----------------+----------------------+--------------+
| XGBoost        | Floor 3              | 98.84%       |
+----------------+----------------------+--------------+
| Neural Network | Floor 3              | 91.46%       |
+----------------+----------------------+--------------+


DETAILED PROBABILITY ANALYSIS:
--------------------------------------------------
+----------------+-----------+-----------+-----------+-----------+
| Model          | Floor 1   | Floor 2   | Floor 3   | Floor 4   |
+================+===========+===========+===========+===========+
| Random Forest  | 0.00%     | 0.00%     | 98.00%    | 2.00%     |
+----------------+-----------+-----------+-----------+-----------+
| XGBoost        | 0.29%     | 0.49%     | 98.84%    | 0.38%     |
+----------------+-----------+-----------+-----------+-----------+
| Neural Network | 1.28%     | 0.60%     | 91.46%    | 1.98%     |
+----------------+-----------+-----------+-----------+-----------+


CONSENSUS ANALYSIS:
--------------------------------------------------
Model Agreement: 100%
Final Assessment: HIGH CONFIDENCE: Floor 3

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

In [ ]: