

# Claims experience for Lorca, 11 May 2011

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## Introduction

On 11 May 2011 two earthquakes took place with their epicentre close to the city of Lorca (Murcia); the first at 17:05, with a magnitude of 4.5 Mw, and the second at 18:47, with a magnitude of 5.1 Mw. These earthquakes caused the death of nine persons and left 300 injured, some seriously, as well as widespread damage to the city's buildings, which was acute in some of them .

This earthquake was the biggest which the Consorcio de Compensación de Seguros (CCS) has had to deal with in its entire history.

Before anything we should note the substantial efforts to assist which the Lorca Civil Protection Service and the Regional Autonomy of Murcia made.

The major earthquake occurred at 18:47 and the Civil Protection Service swiftly ordered that the entire city be evacuated for fear of any aftershocks. The Lorca municipal district had over 92,000 inhabitants, most of whom (some 60,000 people) were living in the main urban cluster, meaning that all of these people had to evacuate the city from 19:00.

The following day, the Civil Protection Service organised an inspection of all buildings, one by one. Via the professional associations, they were assisted in their endeavours by construction experts from across the whole regional autonomy, who disinterestedly and selflessly collaborated alongside the specialists from the City Council. The city and regional fire brigades, as well as the Military Emergencies Unit (the "UME") had to pull down those structural elements that were still hazardous, such as safety railing and parapets, suspended ceilings, etc., building by building. They also had to shore up unstable structures still in danger of falling down. It was highly commendable work.

We shall now go on to outline certain exceptional incidents which emerged from this claims experience as regards the CCS.



In the old part of the city there were many homes that had rooms located in the building on the adjacent plot of land, which had at one time been split up, which gave rise to a whole set of problems when it came to justifying the actual insurance coverage for such abodes or rooms. The quandary also arose of illegal structures or unlawful extension of areas where building is allowed, such as on terraced roofs.

## Preliminary work at the CCS. Estimates

The day after the earthquake, together with adjusters who were regular collaborators with the organisation and who were familiar with the affected area, CCS specialists travelled to Lorca to make an initial estimate of losses and to assess needs in terms of adjusters.

Right from the start, it was evident that every single one of the buildings in the urban centre of Lorca was affected to a greater or lesser extent, so the number of case files would have to be the same as the number of buildings in the city, which was estimated to be some 30,000. During the first visit it was not clear that the damage to the buildings was so serious, as the worst of this was hidden from view, which meant that the average amount for estimated losses was inevitably misjudged. As time passed, more and more structural damage came to light, some of which was hugely significant and would call for major action to be taken, for which reason the initially estimated average amount of loss was gradually revised upwards as more extensive information and evidence was noted. Based on the figure for estimated case files the number of adjusters required was reckoned to be two hundred.

## Incoming claims

Over 33,000 claims were received; 59% via the Helpline Service (CAT for the Spanish), 35% through the CCS website, and the rest by other available means.

Though comparable to other CCS claims experiences, these relative figures were unique for the swiftness with which they were filed. By the 13th, only two days after the earthquakes, 2,477 claims had been filed, while by the 20th, barely nine days afterwards, this figure had climbed to 18,591. 17 May was the day when most claims came in, with a figure of 4,976.

## The Geographic Information System (GIS) and allocation of case files among adjusters

Once case files have been opened, they then have to be assigned to adjusters for assessment work to begin.

CCS uses a GIS to geo-reference the location of every loss-affected risk situation, place it on digital maps and allow files to be allocated to adjusters based on a geographic parameter.

Here we should recognise that Murcia Region presents a whole raft of problems as regards its toponymy, in that it is original and unique in Spain for dividing municipal districts into "councils" or administrative bodies, and due to the fact that in 2011 the digital street maps of Lorca which CCS used (among these the "CartoCiudad" cartographic system) had certain shortcomings. On the other hand, most multi-family buildings have a name by which all the locals know them, yet which do not appear on the digital street maps. When claims are filed citing these and without providing the postal address it becomes impossible to geo-reference the building in question. The problems attaching to geo-referencing in Lorca prompted CCS to seek a new procedure based on the cadastre (tax assessment registry pinpointing the location, dimensions and boundaries of properties) for the purposes of future loss event claims.

## Adjustment criteria and pricing tables

Although standardised assessment should form the basis of adjustment work, in a claims experience involving so many adjusters (and such a concentration of so many insured parties), who in many cases had to deal with unusual types of intervention (such as shoring up, bracing and repair work for structures), uniformity of this kind takes on particular significance. To this end it is important to be able to use a pricing table featuring the most common project units for repairing damage.

Due to the fact that there were several geo-referencing problems in the first month, it was not possible to draw up such a specific pricing table for the most usual types of repair work, so the adjusters were advised to use the pricing tables from CYPE's commercial structures calculation program or else that of the Guadalajara Building Engineers and Quantity Surveyors' Association, which are commonly-used references in the construction industry. Later on, they managed to draw up a pricing table for structural repairs to unify assessments as these were highly important quantitative and qualitative appraisals which called for technical rigour and uniformity. Thus, they would have items to check against when faced with repair estimates that sometimes lacked substance and were poorly justified with respect to the viability of solutions and the costing of these. Unique criteria were also devised to value pre-existing buildings, which enabled not only comparison with the insured capital and whether or not there had been under-insurance but also valuation of buildings in the event of demolition.

## Certain distinctive problems

In the old part of the city there were many homes that had rooms located in the building on the adjacent plot of land, which had at one time been split up, which gave rise to a whole set of problems when it came to justifying the actual insurance coverage for such abodes or rooms. The quandary also arose of illegal structures or unlawful extension of areas where building is allowed, such as on terraced roofs .



## Insurance of damaged property

The level of insurance in Lorca in May 2011 was rather uneven. Because people were still feeling the effects of the 2007 economic and financial crisis most commercial premises were left uninsured and in many cases policies for them had been discontinued on account of the crisis. On the other hand, factories and industrial enterprises did have insurance policies. Business interruption cover was not very extensive in such industrial concerns however, and far less so among commercial premises.

Even so, most homes did have insurance and housing buildings tended to be over-insured with two policies under contract; one for individual own homes and another for the home-owners' community. In most cases these also had uninhabitable home and loss of rent insurance.

## Earthquake intensity. Loss and damage

According to the European Macro-seismic Scale EMS-98 the intensities of the Lorca earthquakes were VI for the first earthquake with a moment magnitude of 4.5 Mw, and VII for the second one, with a moment magnitude of 5.1 Mw.

The EMS-98 seismic intensity scale classifies the severity of earth movement based on the effects which seismic tremors have on a set of objects that can be found in an everyday environment. This is one of the major advantages of the scale as a tool: it does not require instruments to be measured. The sensors that have been used historically can be broken down into four groups: *Living things*, *Ordinary objects*, *Buildings* and *The natural environment*. It thus allows the compression of a description of earthquake effects into a single symbol, a number.

The scale of EMS-98 seismic runs through twelve degrees, from I to XII. According to this scale, an intensity of VII, as in Lorca, is for events where most people are frightened and try to run outdoors. Furniture is shifted and objects fall from shelves in large numbers. *Buildings* suffer a higher or lower grade of damage depending on their structural vulnerability. Both concepts —“vulnerability class” and “grade”— are defined in the scale itself according to structure type.

In Lorca brick buildings generally suffered damage of grades 2-3, while those of reinforced concrete also experienced grade 2-3 damage.

The EMS scale defines damage grades in the following way:

For brick buildings:

- Grade 2: Moderate damage: Cracks in many walls, falling of fairly large pieces of plaster and partial collapse of chimneys.
- Grade 3: Large and extensive cracks in most walls. Roof tiles detach. Chimneys fracture at the roof line. Damage to individual non-structural elements (partitions, gable walls and roofing).

For reinforced concrete buildings:

- Grade 2: Moderate damage: Cracks in columns and beams of frames and in structural walls. Cracks in partition and infill walls. Falling of brittle cladding and plaster. Falling mortar from the joints of prefabricated wall panels.
- Grade 3: Substantial to heavy damage: Cracks in columns and beam column joints of frames at the base and at joints of coupled walls. Spalling of concrete cover, buckling of reinforcement rods. Large cracks in partition and infill walls. Damage to individual infill panels.

And we should recognise that the actual damage was substantial, according to the adjusters, due to the shallowness of the hypocentre or focus, its proximity to the city of Lorca and a very high peak acceleration (0.37g), but above all to the usage of resistant patterns (such as the usage of dwarves which we go on to discuss) and architectural configurations (such as roof barriers) a lack of awareness of the seismic dangerousness of the area, which increased the vulnerability of buildings.

The main damage to buildings with a reinforced concrete structure, which was the type which predominated in Lorca, was cracking and fissuring in masonry (partitioning, enclosures, suspended ceilings, safety railing and parapets, chimneys, etc.) and damage to structural columns. The greatest damage was on the ground and top floors. There was also damage to the stringer beams of the staircase.

The most serious damage was to supports and columns, often fractured in their upper section and sometimes in the lower portion. This damage to supports and columns was often prompted by the very panelling and partitioning that surrounded them, given its greater rigidity. There was also a lot of damage to stump columns, which are very rigid due to their lack of height, meaning that they absorb greater levels of stress. There was also serious damage to buildings, since the slabs of a building acted as "battering rams" against the columns and supports of the neighbouring building given that there were no gaps between both buildings and there were differences in height between the slabs. Furthermore, there were several cases of durability defects in the reinforcements of supports on account of rusting, where such impairment clearly had nothing to do with the earthquake.

## Repair work

Repair work on damage to masonry was the most common kind, filling in the cracks with mortar and meshing prior to painting over the whole plaster finish. In the case of major cracking the partitioning had to be demolished and rebuilt, with the increased costs that this implied from the installation and fitting work. More problems arose in repairing damaged columns and supports.

With respect to structural issues and for the more complex cases, the CCS and its team of adjusters received technical advice from a reputable company of renown called Intemac with objective expertise in the defects and problems besetting unsound buildings. Generally speaking, the repair work was undertaken via proposed action to take on columns and, where feasible, suggested means of restoring the safe and functional conditions of buildings that existed before the earthquake; in other words, attempting not to change rigidity and stress distribution conditions among the various different structural elements. To achieve this, the suggestion was, subject to prior shoring and bracing, to repair the damaged portion of the column with special mortars, stabilise and treat or bolster reinforcements and, in the case of major cracking, to apply propping and redo all or part of the column. In the case of fracturing, it was held to be sufficient to seal it and inject it with fluid sorts of mortar according to the recommendations in the relevant literature on the subject.

Nevertheless, the specialists and construction firms which the insured and the home owners' associations hired preferred above all to reinforce columns with metal splint sections and plating, and to fill in the gaps with types of mortar, even though this was generally without clear criteria regarding their capacity to reinforce or potential to become load-bearing, despite the fact that this sheet metal and plating was reckoned to withstand all stresses without taking into account the concrete support column. Sometimes the solutions proposed involved adding rigidizers lengthways. All of these solutions add uncertainty in that they alter the rigidity of the damaged column relative to those that were left unharmed, which means that exactly how the structure behaves given another earthquake of some significance becomes even more unpredictable.

## Construction in Lorca

An earthquake comprises a series of waves that pass through the natural terrain from the hypocentre or focus which causes movement of the earth that feeds through to each building, becoming increasingly intense and making it shake or vibrate. The building behaves like a pendulum. The period over which the building vibrates and the wave lasts is important. The terrain on which the building has its foundations is also highly significant.

According to the experts and adjusters, buildings have been erected in Lorca without taking into account the NCSE-02 seismic resilience standard or previous versions, which means, for example, that care has not been taken to ensure that there is a small space between adjacent buildings that allows buildings to vibrate without harming neighbouring structures, since each building has a different vibration period and will shake differently. Likewise, permission has been given to put up railing and parapets on terraced roofs or many squat columns have been put up on the ground floor. On the other hand, it is very positive that there are many buildings standing alone that can vibrate freely.

## Buildings in technical and economic ruination



On 18 May 2011, seven days after the earthquake event, Lorca Council made a start on demolishing the first building, the “Princesa” residential community comprising numbers 57, 59 and 61 on the Granada road.

The chief characteristic of the Lorca claims experience for CCS was the large number of buildings that were demolished and which had to be indemnified by appraising their rebuilding value. CCS had never paid out for so many entire buildings. Neither have insurers had experiences involving so many total losses for buildings as CCS.

To justify knocking down buildings Lorca Council began resorting to declarations of technical ruin. In quite a few cases the firm specialising in structural defects and problems which was advising CCS (Intemac) held that it was possible to undertake repairs to buildings using commonly-applied techniques and at a reasonable cost. Yet jurisdictional authority lay with the Council and moreover it had other technical reports to cite which did actually claim that the buildings were in a state of technical ruin.

After a certain time, Lorca Council encouraged the demolition of buildings based on declarations of economic ruin. Let us now define these concepts:

- Technical ruin. The building displays evidence that its structural or fundamental elements have been rendered generally no longer usable.
- Economic ruin. The building exhibits damage to the extent that the cost of repair work to restore it to its former state of safety and sound condition is more than 50% of the present value of the building excluding the land value.

It is readily understandable that with buildings of a certain age their current value was very low, so consequently, even though the cost of repairing them was low, it is likely that this might exceed 50% of the value of the building, leading to them being declared in a state of economic ruin. Faced with this situation, CCS found itself saddled with an insurance policy that was taken out subject to a valuation set at replacement as new, which meant that in the event of demolition due to economic ruination it would be asked to defray the cost of rebuilding the structure in question instead of repairing it. The decision to rebuild instead of undertaking repair is not a rational one. This was why CCS decided that in the case of economic ruin, it would not shoulder full indemnification of the building but would instead appraise the damage to be repaired and pay out compensation for that amount. This decision led to many buildings declared to be in a state of economic ruin not being demolished.

For those buildings that were demolished CCS established a procedure for valuing loss or damage: Intemac drew up a plan and a repair proposal, a pricing table for project units was formulated and a team of adjusters who were specialists in construction was set up who drafted a repair proposal for each building using the information mentioned.

## Appraisal of demolished buildings

The fact that many buildings had been pulled down posed a novel problem for CCS which it had never encountered before. Although it is true that on the odd occasion it had had to indemnify an entire building, this had always been an isolated case. In the insurance industry a valuation of the building is carried out to calculate the premium and, where appropriate, apply under-insurance, but in only a few cases will this suffice to rebuild the structure.

From the very beginning it was decided to devise a straightforward procedure which would allow consistency among the adjusters and make use of pricing tables and tools which architects utilise in their work.

To this end CCS decided to use CYPE's modules. This is a software which the company CYPE Ingenieros, S.A. produces and is widely used among construction specialists in the Spanish Levant and also throughout the rest of Spain. The Murcia Region uses it in its technical and tax-related calculations.

CYPE's modules provide for the construction cost for three quality classes of different kinds of residential buildings: single family homes, multi-family housing, according to the number of housing units and depending on whether it is a stand-alone block of dwellings or a block enclosed by streets. It was thought that the modules which dated from 2011 were accurate, except at basic-quality level, which was held to be on the low side and augmented by 15%. The module was applied to the amount of the home's number of built square metres. A set of costs were added to this estimate: budget items for health and safety, general costs and contractor's profit, geo-technical survey, architect and quantity surveyor's fees, VAT, urban development licenses and constructor's guarantee insurance. This is how we arrived at the amount to be indemnified, which we paid out without asking for approval. As expected, several home owners' communities did not agree, not because the criterion was in error, but since the insured wanted the

new building to have more functional capability than the old one such as, for example, an underground garage, quality enhancements, etc.

In cases of disapproval of this kind, CCS followed a more detailed procedure. It asked the Council for the old technical plan for the building. This provided information on quality levels, precise measurements, etc. Besides resource modules, the CYPE software also has a function called a budget reckoner, which enables a detailed estimate to be obtained by keying in information and measurements which define the specific building. This is arrived at having selected from different options under the various headings for a building estimate.

This estimate was then adjusted to allow for the measurements and quality levels in the technical drawings for the old building. As is logical, those enhancements that were mandatory according to the Technical Building Code were accepted. This produced an up-to-date estimate also in keeping with the quality levels of the building to be indemnified. This estimate was the one which was disputed with the insured's adjuster, who ended up accepting the criterion used by CCS. Normally an estimate below the initial result emerged, but the latter was maintained.

We should concede that the insured persons claimed several expenses that were not provided for in our procedure, such as notary's fees, processing and administration costs, commercial expenses, etc. In general, these were minor and could be assimilated by the discrepancy in estimates.

## Intemac's advisory work

It was very important for CCS to have been backed up and advised by the company Intemac in the Lorca claims experience with respect to structural damage cases.

Intemac's technical experts studied some 350 buildings in Lorca for which they drafted damage reports, assessed the suitability of the repairs which the technical specialists of the insured or construction companies recommended and, together with the adjusters, took part in work meetings with them where they discussed repair procedures or even structural faults and defects observed. Besides this, as we said earlier, they drew up repair plans for buildings in a state of economic ruin.

Finally, at the request of CCS, they wrote up their experience in a book which CCS published called "[The Lorca earthquake. Effects on buildings.](#)"

Via this book, CCS kept up its interest in publishing the experience of adjusters and specialists in earthquake loss events, thus following in the footsteps of the book by Higinio Arcos Trancho and María Cristina Porcu titled "[Seismic movement and walled structures. Origin, impact and assessment of damage to traditional homes](#)" which featured the experience drawn from the Mula earthquake of 1999. This was published in 2003.

In the wake of Lorca, advisory assistance from firms and technical experts for CCS adjusters has become more commonplace where structural defects and problems, geo-technics and other specialist subjects are concerned.



## The insured's adjusters

At the beginning, the adjusters from Murcia Region who usually work as adjusters for the insured played no part in events, because most of the damage related to housing and they were used to performing adjustment only for industrial and business risks. The technical experts from construction companies that had won contracts for repairs and rebuilding work therefore stood in for them. Subsequently, when they observed how the damage was severe and complex, they started to accept work as adjusters acting for a party.

### Conclusions

The Lorca earthquake of 11 May 2011 was the most substantial claims experience prompted by an earthquake which the CCS has had to deal with.

In certain cases, the procedures which were adopted in Lorca have since been retained as CCS working procedures.

Lorca was a claims experience that involved a lot of buildings that were a total loss and therefore entailed major indemnities, which is not common in the world of insurance, even in other natural disasters which CCS covers. This forced CCS to perform a detailed examination of valuation for buildings and establish a procedure to calculate for the pre-existing condition, since this not only applies to checking up on the sum assured and any under-insurance, but it also has a direct bearing on the indemnity. This procedure for valuing pre-existing condition using the CYPE modules which began in Lorca is the one which CCS still uses today.

The geo-referencing problems experienced in Lorca for assorted reasons, such as the shortcomings of street maps, forced CCS to seek out new geo-referencing procedures. It was based on the Lorca experience that geo-referencing was developed using the cadastre and the cadastral reference as a national ID number for buildings.

In the wake of Lorca, advisory assistance for adjusters on structural defects and problems and geo-technics has become more commonplace.

And finally, we should highlight the publication of a book on earthquakes which the Intemac technical experts wrote.