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Construction Site Planning for the Reconstruction of a Historic Earthquake City: the Case Study of L'Aquila

KEYWORDS: EARTHQUAKE, L'AQUILA, RECONSTRUCTION, CONSTRUCTION SITE PLANNING, EARTHQUAKE OLD TOWN

The earthquake that hit the city of L'Aquila on 6th April 2009 represents the first seismic event, after that of Messina in 1908, that interested such a wide and urbanized area as that of a county seat. Emerged problems after this occurrence, the mistakes that have been made and the set of adopted solutions, made L'Aquila to become a real "knowledge laboratory".

In this context, the attention focuses on the complex issue of L'Aquila old town reconstruction, often defined by the most important newspapers as "the biggest construction site of Europe". Once have analyzed the procedures that the city council put in place, it is observed an absence of an instrument of planning through which to coordinate the construction sites simultaneously operating on the area. The first to deal with this problem has been the municipality of Villa Sant'Angelo, that through the drafting of a "general construction site plan", attempted to manage the critical issues about reconstruction. Starting from this cue, an elaboration of a general construction site plan is proposed for the "central axis" of L'Aquila old town. The goal is to plan construction site activities on the base of strategic choices followed from L'Aquila old town conditions after the earthquake, by referring to an urban scale instead of considering individually each single construction site. A work plan is obtained through the definition of requirements concerning the priority criteria for action, the old town viability, the logistics of construction sites and the rubble disposal. This plan fosters a more functional and safer reconstruction, and a fairer use of public spaces from companies which execute private works.

Therefore, by using as starting point the implementation of the method in the case study of L'Aquila, it is here proposed an application solution concerning the management of reconstruction of Italian old towns hit by earthquakes.



INTRODUCTION

Italy is one of the countries in the Mediterranean area which has got higher seismic risk, because of both the frequency of the earthquakes that hit the country throughout history, and for their magnitude. The earthquake that hit the city of L'Aquila on 6th April 2009 generated a so-called seismic crater that comprises 56 municipalities and concerns an area of almost 2.400 Km². In light of this, the reconstruction process of L'Aquila has been soon defined as "the biggest

construction site of Europe". Because of the particularly complex situation, the seismic crater became a real "knowledge laboratory". This experience, in fact, reignited in everyone the sense of importance of seismic prevention in Italy, and led also to implement new models and techniques of intervention both in the emergency phase and in that of reconstruction.

In an old town that has been hit by an earthquake, there are two typologies of after-earthquake construction site.

A first typology is the one concerning the moment immediately after the emergency and that includes construction sites for compelling intervention of safety works. The second typology refers to building sites for reconstruction. Those operate by following the rules laid down in the Uniform Code of Health and Safety at Work, but display more complex scenarios in comparison with a common building site, due to the presence of various risk factors. It is clear that for a construction site of an old town

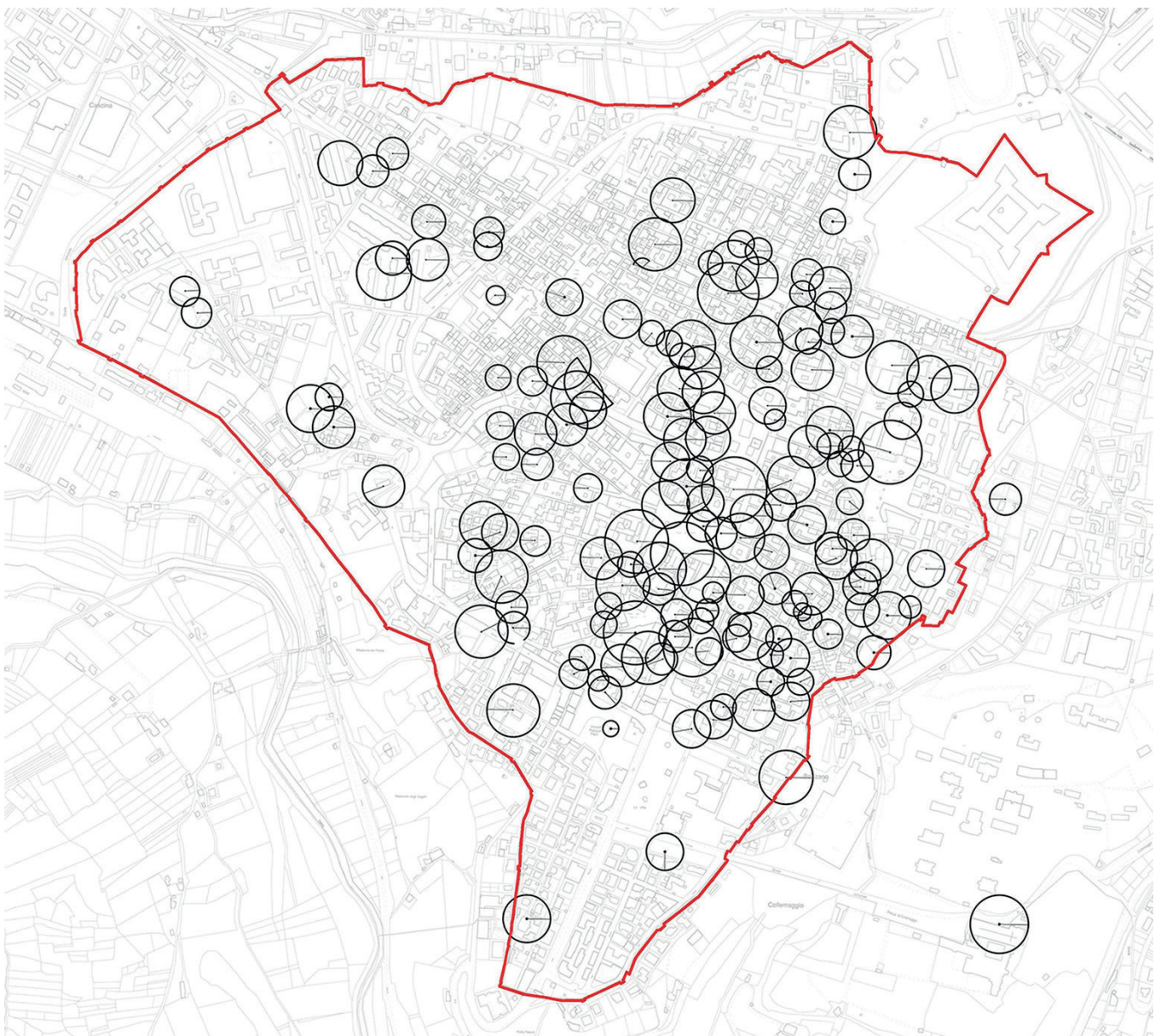


Figure 1: Plan of the active cranes encumbrance in the old town of L'Aquila, October 2017

reconstruction it is necessary to foresee very special planning and organization features, that aim to obtain a flexible and complex structure, articulated on the base of the nature of the existing one. The main problems that can be observed in this field concern in particular: the management of public spaces by many construction sites, the existence of impactful emergency structures and a reduced viability with a subsequent reduction of room for means maneuver. Despite these are problems concerning in particular executing companies of private works, it is necessary that the city council manages and leads the reconstruction through the action planning on a urban scale. What has been missing in L'Aquila has been the cooperation between public and private spheres; this brought to a non-planned and, consequently, non-homogeneous reconstruction. In light of this, it has been developed a general construction site plan for the old town of L'Aquila, which provides the guidelines for implementing a more functional and coordinated reconstruction. The main objective of the plan it will be to develop a logical approach to design and organize the reconstruction site on an extensive area. The development of the general construction site plan for the case of L'Aquila represents the starting point for having the tools to better understand the problem of the reconstruction site management. In this way, it will be possible to apply this method, not only for the territories hit by the earthquake but also for those affected by other disasters due to natural hazards (e.g. floods, tsunamis, landslides, etc.).

THE RECONSTRUCTION OF L'AQUILA OLD TOWN

THE RECONSTRUCTION PLAN

The approach adopted by the Municipality of L'Aquila for reconstruction activities is based on contents of the extraordinary legislation on reconstruction, issued by the Government and the Commissioner-Delegate; those are the Law n. 77 of

24th June 2009 and the Decree n. 3 of 9th March 2010, respectively. In particular, the law 77/2009 introduces again the Reconstruction Plan as an instrument of urban planning by setting its aims, including: the socio-economic recovery of the city, the upgrading of the housing stock and the return of people into the houses damaged by the earthquake. The Reconstruction Plan is defined as a technical instrument, which unifies more "levels of planning" as the strategic plan, the general urban equipment and the implementing planning. Those are comprised in a single and articulate planning programming process.

The above-mentioned decree sets goals and procedures for the drafting of the Reconstruction Plan. In particular, with a view to the arrangement of the strategic guidelines for old towns reconstruction, the Municipality of L'Aquila defined the boundaries of each old town in the county seat and in the hamlets, by identifying reconstruction settings. Into those settings, it is forecasted the presentation and the following check of intervention proposals after public notices issued by the Mayor. This approach favors the current urban and territorial refiguration, while pursuing the direct and free recovery and consolidation measures of damaged buildings; this is made through the possibility to proceed with the reconstruction by using proposing plans, made by single areas or sections of areas, in conformity with the current Land-use planning. By following this line of action, the old town reconstruction has been left to chance, to the individual initiative and without an overview of the city. For all those reasons, the reconstruction plan turns out to be an ineffective instrument for managing the reconstruction of L'Aquila.

THE OFFICE FOR THE SUPER-COORDINATION OF CONSTRUCTION SITES

With the Protocol of Understanding called Emergenza sisma Abruzzo 2009, of 30th November 2009, it has been agreed on the necessity to optimize and safely manage the multitude of

temporary or mobile construction sites in the old town of L'Aquila, during the phase of the buildings securing. It has been set up the Office for the Super-Coordination of Safety in Construction Sites. In the same protocol it has been considered, moreover, the extension of the office tasks also during the reconstruction phase. The Office for Coordination represents a support for the municipal Administration and is mainly committed to the control of each Safety Coordinator's tasks relatively to provisions and requirements aimed to the respect of the current regulation on safety in work places. During the phase of L'Aquila old town reconstruction, the main activities of the office concern the definition of the safety and health requirements for the logistic of construction sites and the requirements for the behavior of Safety Coordinators (in the phases of projecting and implementing) and of executing companies. In particular, technicians of USC complement the Coordinators during the phase of implementing the activities related with the logistic of construction sites' common areas and the managing of interferences among many processing, by organizing periodic meetings of construction sites coordination and by encouraging training meetings in order to make known all the issues concerning the risks in the construction sites for reconstruction. Although this represents a key aspect in the field of a such complex reconstruction, the office for the coordination of construction sites drafts guidelines limited only to the issue of safety in the construction sites and to the control of regularity of workers during the operative phase of the construction sites.

THE GENERAL CONSTRUCTION SITE PLAN OF VILLA SANT'ANGELO

By analyzing the difficult development of reconstruction of L'Aquila old town, it results essential the contribution given by the municipality of Villa Sant'Angelo (AQ), with the development of the General

Construction Site Plan of its old town and of the hamlet Tussillo. The project starts with the goal to meet the requirements of companies that are going to work simultaneously in the hamlet old town, in order to let them avoid, for example, problems in the implementing phase of the construction site, related to a wrong positioning of the crane from a company which could hinder the installation of equipment in adjacent construction sites. Relating to this, it is considered that each Safety Coordinator, when drafting the Safety and Coordination Planning, should include also the claims contained in the General Construction Site Plan of the related construction site. In particular, the plan include a series of graphical documents which relate to: the partition in transit areas, with the aim to better organize the spaces management; the identification of vehicle accesses to the old town and the main viable ways of which the smallest dimensions of roadway are given; the identification of the already working construction sites; the indication of spaces to be allocated to each construction site (crane, storage areas, scaffolds); the arrangement of an emergency plan; a more detailed evaluation referring to the dimensions of the streets and the resulting biggest dimension of the scaffolding that could be installed, in order to preserve the viability.

In all the documents, the area of the Municipality is analyzed as a single construction site, without considering special provisions for each built-up area; it is considered the whole old town by analyzing all the features in order to evaluate the possible risk scenarios.

The general construction site plan of Villa Sant'Angelo, for its importance, is considered to be a "pilot project", because it has got all the features to be presented to the other municipal administrations in the area hit by the earthquake, as a practice to be preferred in the field of reconstruction. Nevertheless, the project has never been taken into consideration by the Municipality of L'Aquila and it is not clear the reason of it. In respect of this, it is necessary to

make some considerations: the width of the surface area of the Municipality of L'Aquila is almost hundred times bigger in comparison with that of Villa Sant'Angelo, that is a small hamlet with only 427 inhabitants; moreover, the old town of L'Aquila is characterized by a considerable

cultural heritage that makes it one of the main medieval centers of central Italy. On the base of these evaluations, the municipality's choice not to consider a planning tool like that of Villa Sant'Angelo could seem nearly forced, however it is still unjustified. The result of those

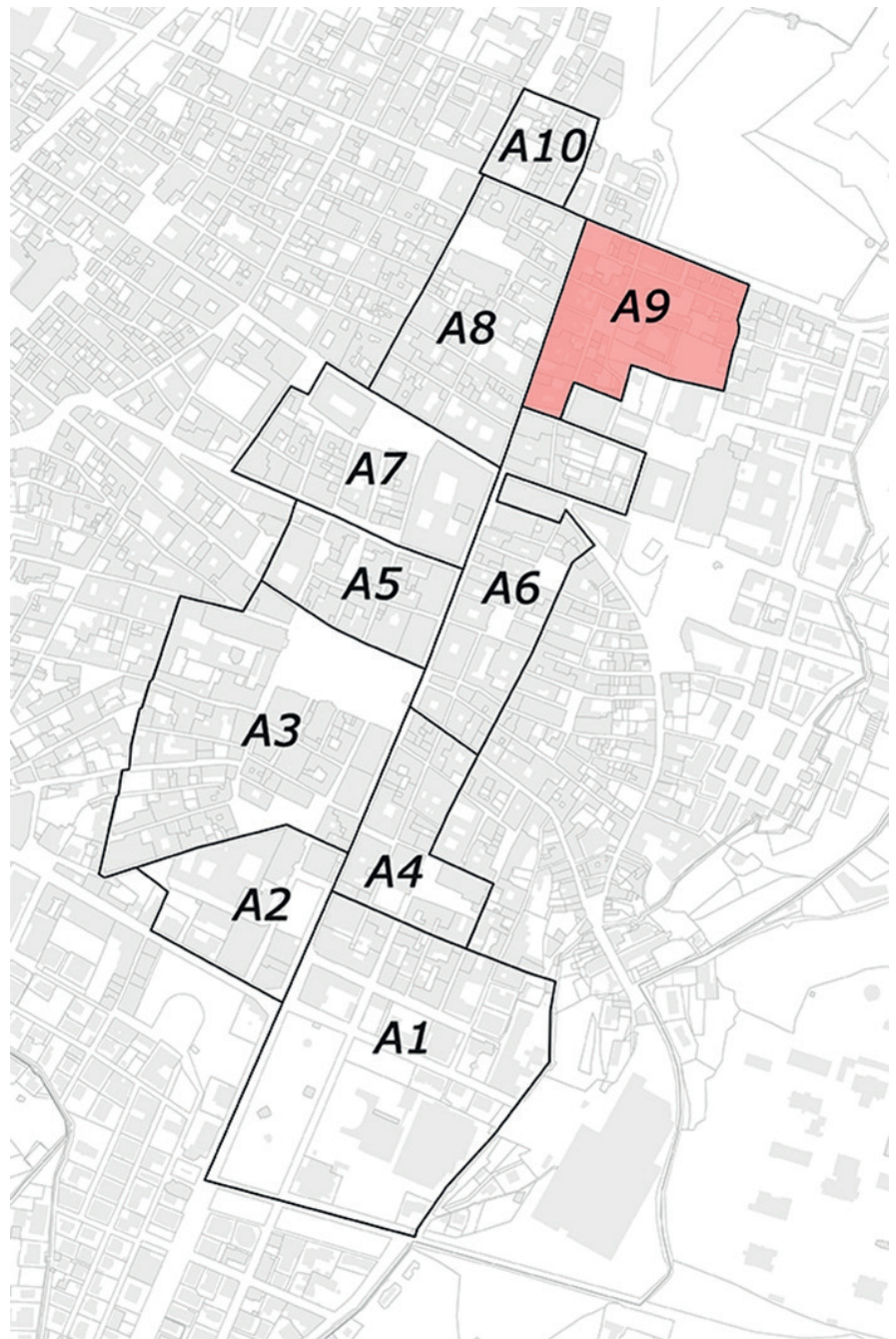


Figure 2: Compartment 9 of the central axis

choices is in fact clear in the troubled situation that can be found in the old town of L'Aquila. A striking example of this is the well-known problem related to the multitude of working cranes in the city old town and the connected problems due to interferences. (Fig. 01)

GENERAL CONSTRUCTION SITE PLAN IMPLEMENTATION: THE CASE STUDY OF L'AQUILA

Without the drafting of a general construction site plan, the reconstruction process risks to be abandoned to the private initiative. The result, as it actually happened in the old town of L'Aquila, is

that the choices of the building company that receives first the grant for starting the works, could hinder the organization of the adjacent construction sites, making them start later with the work implementation. As in the plan issued by the Municipality of Villa Sant'Angelo, also for the old town of L'Aquila it is proposed the elaboration of a method aimed to define the technical guidelines to create a safer and more efficient construction site. More specifically, an example of implementation is suggested for a section of the central axis of the city old town. The central axis is an area of the old town of L'Aquila that stretches along the main guideline (Corso Vittorio Emanuele). This is the city fulcrum, but at the same

time it is also the most problematic area, because it has got all the main, unique features of Italian old towns: narrow alleys, structural units belonging to different historical periods, non-uniform construction techniques etc. In addition to those singular features, there are also other features which distinguish an old town hit by an earthquake: the implementation of some safety works, unstable buildings, ruins on the ground, restricted areas, but in particular the co-existence of many activities and subjects of a different kind (Firefighters, Army, citizens, technicians, designers, workers etc.). In order to manage at best the reconstruction of the central axis, the Municipality foresees the partition of this area into compartments, each of which has got different dimensions and features. The compartments that make the central axis are 10, but it is taken into account only the compartment number 9. (Fig.02)

The general construction site plan, besides giving information on ways to start the work, includes the provision of criteria for intervention priority. More specifically, two priority levels are defined, one for compartments, the other for building aggregates. For what concerns the first level, it is taken into account: the existence of main houses and commercial activities; the strategic positioning referred to the presence of wide areas that can be used for construction sites and to the presence of an adequate viability; the existence of collapses or demolished/ that have to be demolished buildings. For what concerns the second priority level, we have to evaluate: the habitability results of each building aggregate; the location of the intervention, while taking into account the existence of widening and easily viable streets nearby the building aggregate; the intended use, by giving priority to houses and to commercial activities.

More in detail, the suggested general construction site plan develops in two phases: exploratory phase and implementing phase.

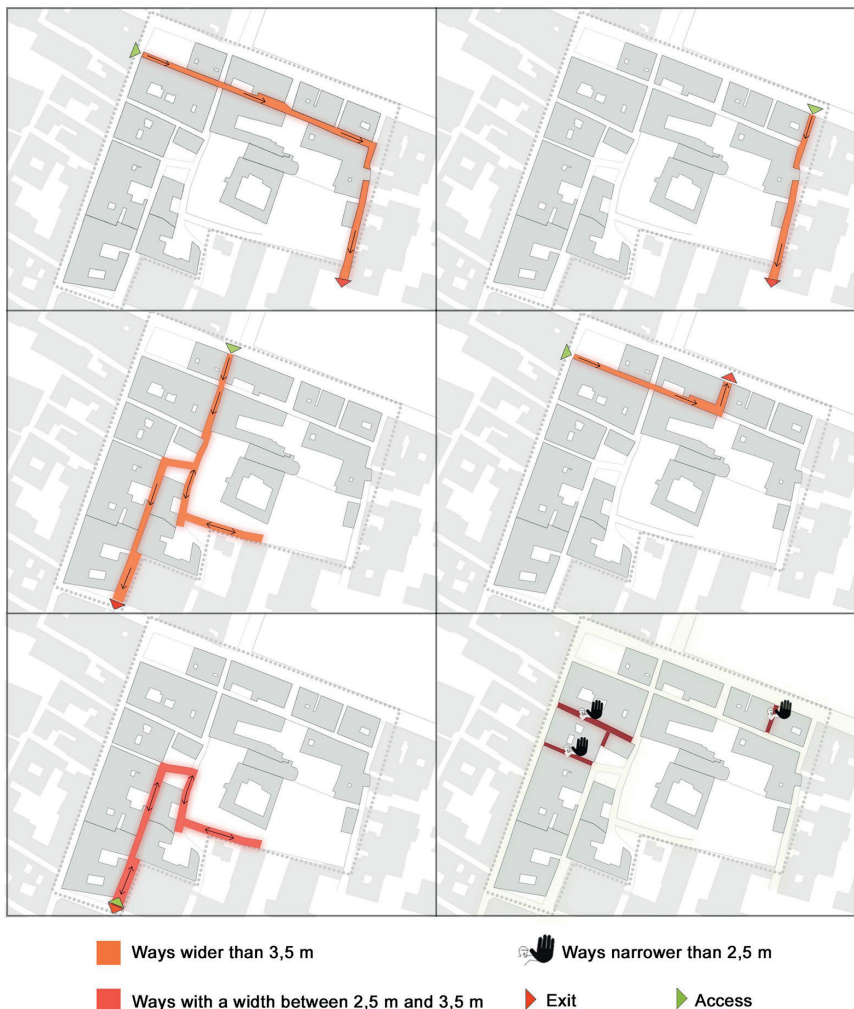


Figure 3: Way typologies identified on the base of their dimension

THE EXPLORATORY PHASE OF THE PLAN

The first step of the exploratory phase includes the compartment framing into the old town and the mapping of the habitability results of each building aggregate that constitutes it. After this, it must be identified the possible accesses to the compartment, directions of travel and the viable ways, of which must be reported the smallest dimension. In this way it is possible to establish which of them must be limited and to what kind of means can circulate. In the compartment 9 it is possible to identify three typologies of way: ways narrower than 2,5 m, which could not circulate; ways with a width between 2,5 m and 3,5 m; finally, ways wider than 3,5 m. (Fig. 03)

Once having analyzed the viability it is possible to evaluate the existence of areas that, considering dimensions and accessibility, can be used as operative logistic centers of construction sites within a compartment. In the same analysis are also taken into account all those smaller areas as, for example, courtyards, widening, small squares that can be destined to the installation of equipment and infrastructures of construction sites.

THE IMPLEMENTING PHASE OF THE PLAN

Knowing the frame of compartment features, in this stage it is possible to set the requirement concerning the building aggregates construction sites. Firstly, it must be defined the hypothetical location of cranes for each building aggregate, considering those as simultaneously active. Then, we proceed with the interferences evaluation: in case those do not allow to safely carry out the activities, we have to evaluate the priority of intervention among the examined building aggregates, by establishing which construction site should cease. In this way it is possible to define two stages of construction site in which the requirements about the safety in the use of lifting machineries are met. (Fig. 04) (Fig. 05)



With reference only to the phase 1, the scaffolds typologies that guarantee an easy and safe viability for the construction site and first-aid vehicles are defined. Because of the existence of small ways, it is preferred

the use of scaffold with narrow start. The construction companies should respect the maximum dimensions of encumbrance that have been reported in the plan. (Fig. 06)

Figure 4: Cranes plan, phase 1
Figure 5: Cranes plan, phase 2

Once having defined the scaffold typologies, it must be calculated the dimension of ways excluding their encumbrance, in order to define the typology and dimension of means that can circulate.

On the base of access viability to each construction site and of the areas destined to the setting up of those, it is established – approximately – the typology of temporary containers for rubble.

First of all, it is necessary to quantify the rubble generated for each building aggregate. Unfortunately it is not possible, for this kind of analysis, to access whole and truthful data to quantify the rubble production. To obtain an approximate esteem, then, at first it is

calculated the empty volume times full volume of buildings. After this, it must be determined the incidence of rubble on m^3 of a building, referring to the paper about the esteem quantifying rubble drafted in 2010 by the Institute for Construction Technologies in cooperation with the National Fire Department. In this document it is reported the incidence of the damage extent level on the total rubble volume on the ground. Because it has not been possible to define the level of damage of each building in the data sheets AeDES, it has been considered the worst circumstance. Then, it has been associated to each building aggregate evaluated as condemned the higher level of damage. This, by following the directives of the above-mentioned

paper, affects the volume of rubble with a percentage of 1. You obtain, in this way, for each building, the approximate rubble volume that it is possible to generate. Having obtained those results, while considering the dimension of builder skips available on the market, it can be evaluated the necessary amount of those to be foreseen in each construction site, by taking into account the meters squares for each building aggregate and, in particular, on the base of the dimension of the access way to this area. It is necessary to evaluate which means can transit, by considering the encumbrance of scaffolds and needed maneuver spaces and, by taking this into account, also the size of the builder skip that has to be positioned. **(Fig. 07)**

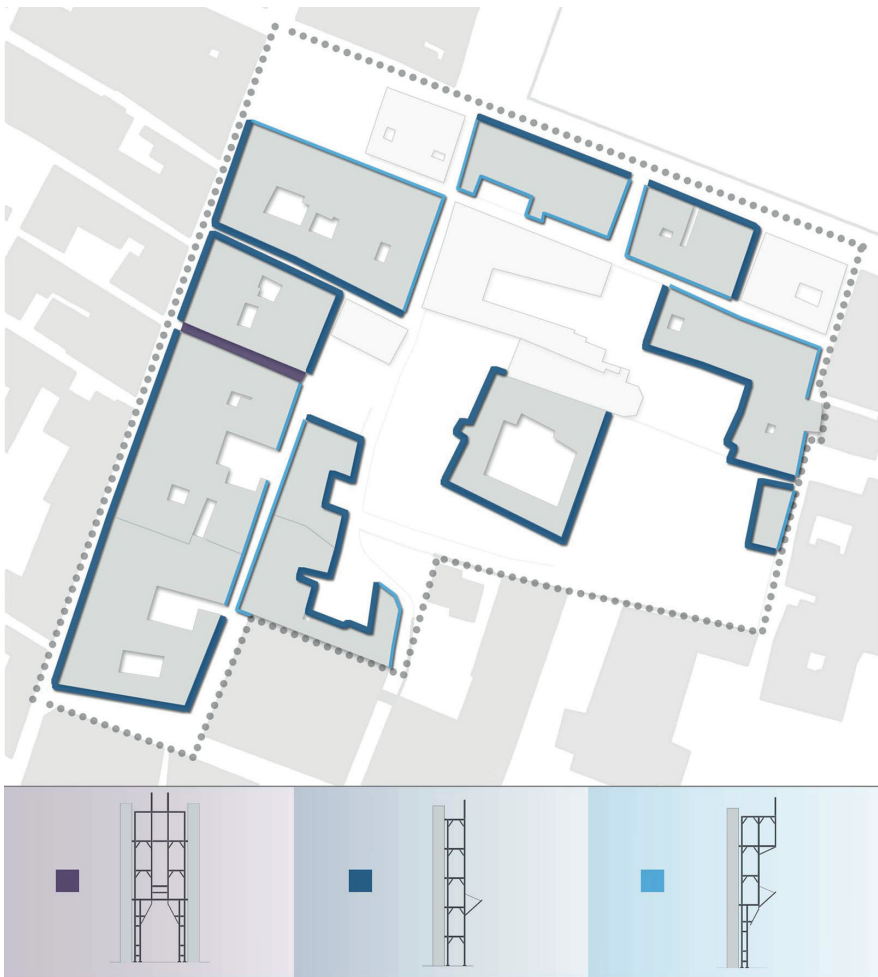


Figure 6: Typologies of considered scaffolds

Integral element of the general construction site plan is the rubble transport plan. For the rubble storage, the Municipality identified external areas to the construction site of L'Aquila, which have got the appropriate features for containing a great quantity of material and that will be the "attraction points" towards which small vehicles coming from many working construction sites in the old town will head. In light of this, it is necessary to evaluate the traffic level of the vehicles that every day will carry the rubble from the construction site to the storage points, often located many kilometers away from the old town. For this reason three strategic choices have been developed:

1. In order to lower as much as possible the ways overload, it is proposed the identification of temporary delivery points, near the old town, used by a variable number of compartments. The rubble coming from many construction sites will be drop off in those areas and later will be carried in storage areas identified by the Municipality, by bigger vehicles. After this, the central axis is divided into transit areas and for each one it is determined a temporary storage point and established the service

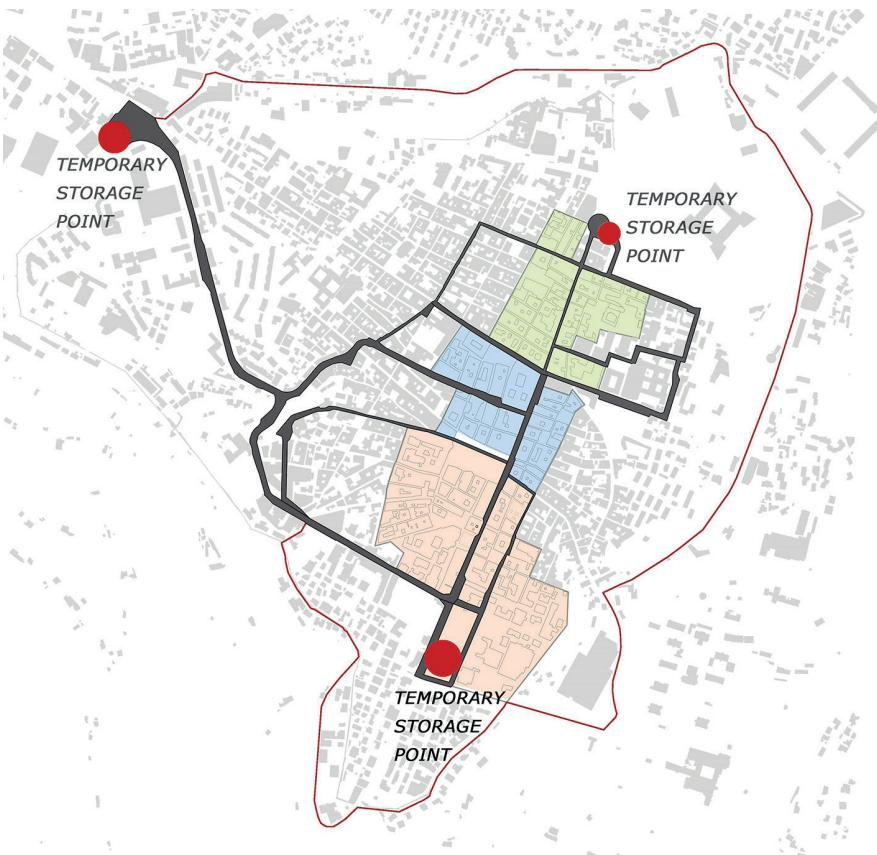


Figure 7: Map of the builder skips

Figure 8: Three different transit area and temporary storage point

viability. In making this partition, it has been followed the statement of the present directions of motion. Moreover, the logic behind the identification of the boundaries of each area based on the willing to guarantee a fair distribution of rubble quantity for each delivery point. **(Fig. 08)**

Once having set the transit areas, it is carried out an analysis on viability of means of the compartment n° 9, included in the transit area 1. More specifically, at this stage are analyzed the accessible routes that connect the contemplated compartment with the temporary delivery point. Then, two different ways are identified, on the base of the building aggregate location. Those are the only possible ways to be transited, in order to allow the rubble disposal. **(Fig. 09) (Fig. 10)**

2. The second strategic choice refers to the transport means: it is considered, for each construction site, the use of a single mean. In this way there is the willing to reduce the environmental impact caused by the traffic of construction site means, but not only. The final aim is to lower the negative aspects related to the traffic of those kind of means in urban areas as, for example, traffic jam, the noise and atmospheric pollution and car accidents. It must be taken into account that only in the compartment 9 is contemplated, in the first phase, the simultaneity of 11 construction sites and can be approximately foreseen the same number for all the other compartment of the central axis. It is clear, so, that the issue of rubble transportation must be faced by having the reduction of such a traffic as a priority, in order to better manage the rubble removal and to guarantee greater safety.
3. Finally, the choice connected with the production of rubble is strictly related to the one I mentioned above. By considering the transit of a single mean for each construction

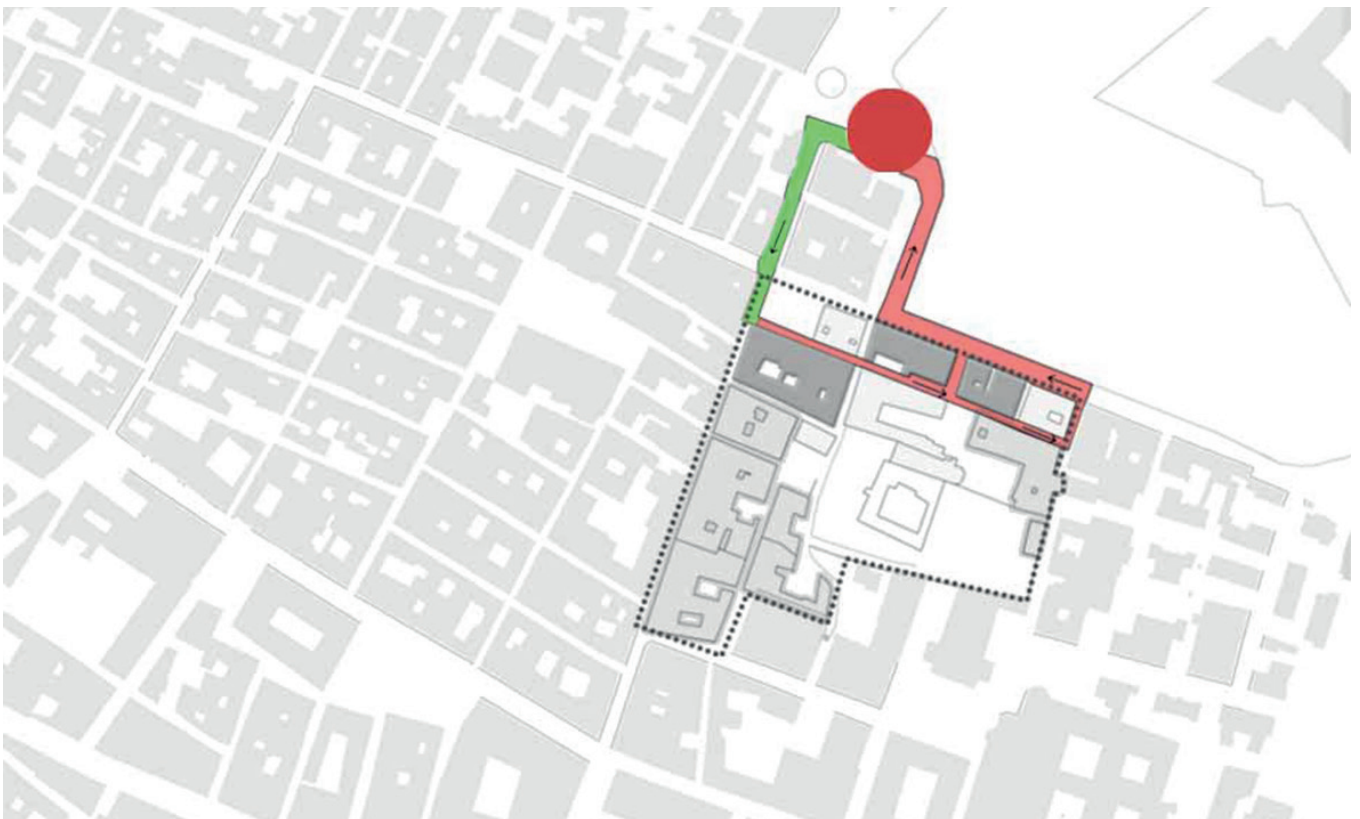
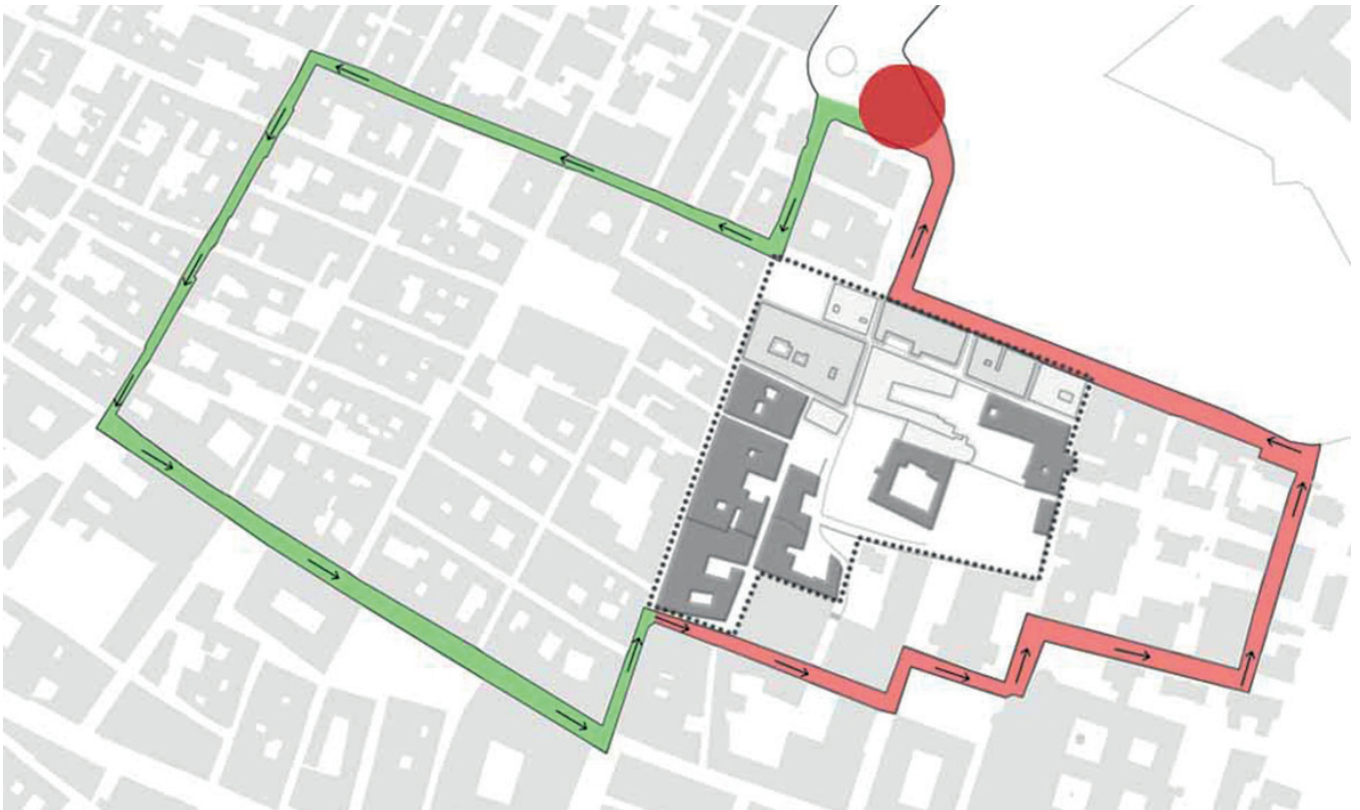
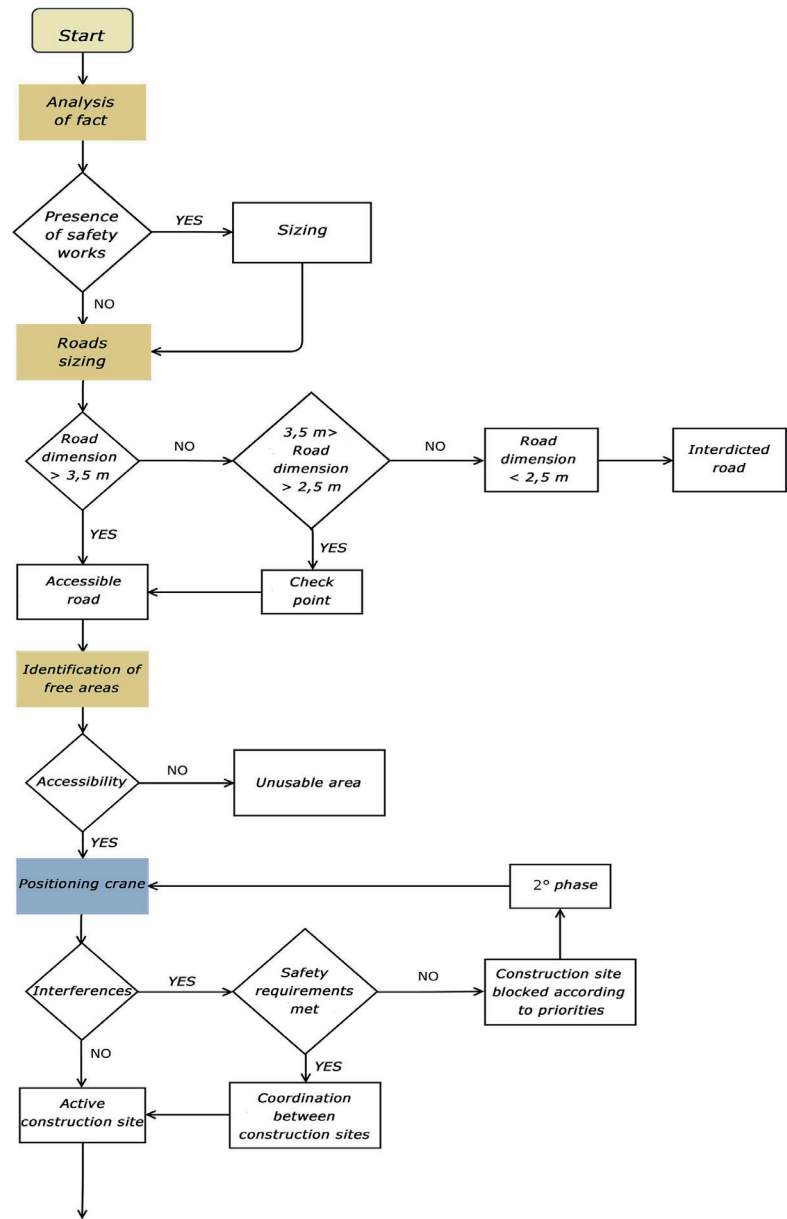


Figure 9: Route A
Figure 10: Route B

site, it is necessary to identify an upper limit of rubble quantity that can be generated, in order to guarantee their transportation within the workday. It is set for each aggregate: the means typology that is possible to use for the material transportation; the path length from the point of rubble loading to the point of delivery and from this last one to the starting point; the time spent for loading/delivering the material is the same spent to cover the whole path. In this way it is possible to determine the maximum rubble quantity that can be carried in a workday and determining, accordingly, a demolition timeline.

Those decisions let us obtain on the one hand a safer viability, both at a construction site level and at a urban level, considering also the presence of technicians, law enforcement and State military special forces. On the other hand, those choices cause an extension of the work phases because of a slower waste disposal. This result, however, must be compared with the situation in which it is not foreseen a general construction site plan. Without it works would be faster, but with poor organization and left to the private initiative, while causing high traffic in the ways of the old town and more interferences among many adjacent construction sites.

The activities included in the plan represent a sequence that can be standardized. The following flow chart resumes the choices, the analysis and the strategies depicted in this work, showing that the method can be applied to all the old towns hit by earthquakes. It is necessary to state that data used in this analysis are rough and often based on the event of the worst conditions. For this very reason, the plan realized for the compartment n.9 could be a model to create a real planning tool that can be applied as a valid alternative to the modus operandi of L'Aquila. (Fig. 11) (Fig. 12)



CONCLUSIONS

The requirements set for the compartment 9 can be extended and acted in all the compartments of the central axis. Through the implementation of the preliminary study included in the plan, in fact, it is possible to know the features of places, the major problems related to the construction site and to obtain a deeper knowledge of the

whole area. On the base of this, it will be possible to set the guidelines, essential for the construction site, for working safely and for the disposal of waste materials. It will be identified, in relation with priority criteria, a first phase of construction site of the whole central axis, in which the interference among adjacent construction sites will be few and managed easily. The reconstruction process will be more effective and, in particular, supervised by the municipal

Figure 11: Flow chart

authorities, who through the general construction site plan will be able to have a global vision on all the activities carried out in the old town. With the application of the guidelines the reconstruction site will be certainly be longer, but on the other hand it could be found to respond to one of the main problem of the L'Aquila case, that is the repopulation of the old town. Until now there are many case in which the owner of a restored private house is having to live in a place surrounded by many construction sites, without any services and consequently in an uninhabitable place. For this reason the strategic choices that distinguish the analysis of this plan aim both to enhance the use of public spaces and to make an homogeneous reconstruction process, well organized and set by following objective criteria. Providing for the contemporaneity of as many activities as possible, the plan allows for the reconstruction of several compartments at the same time.

The L'Aquila experience gives the possibility to employ new methods for the management of the reconstruction. This is why the general construction site plan represents an initial contribution to improve the procedures implemented in L'Aquila. It could be interesting to extend this method for all the most recent earthquake sites and so as to make the plan a procedure to be included in the competent activities of the public administrations.

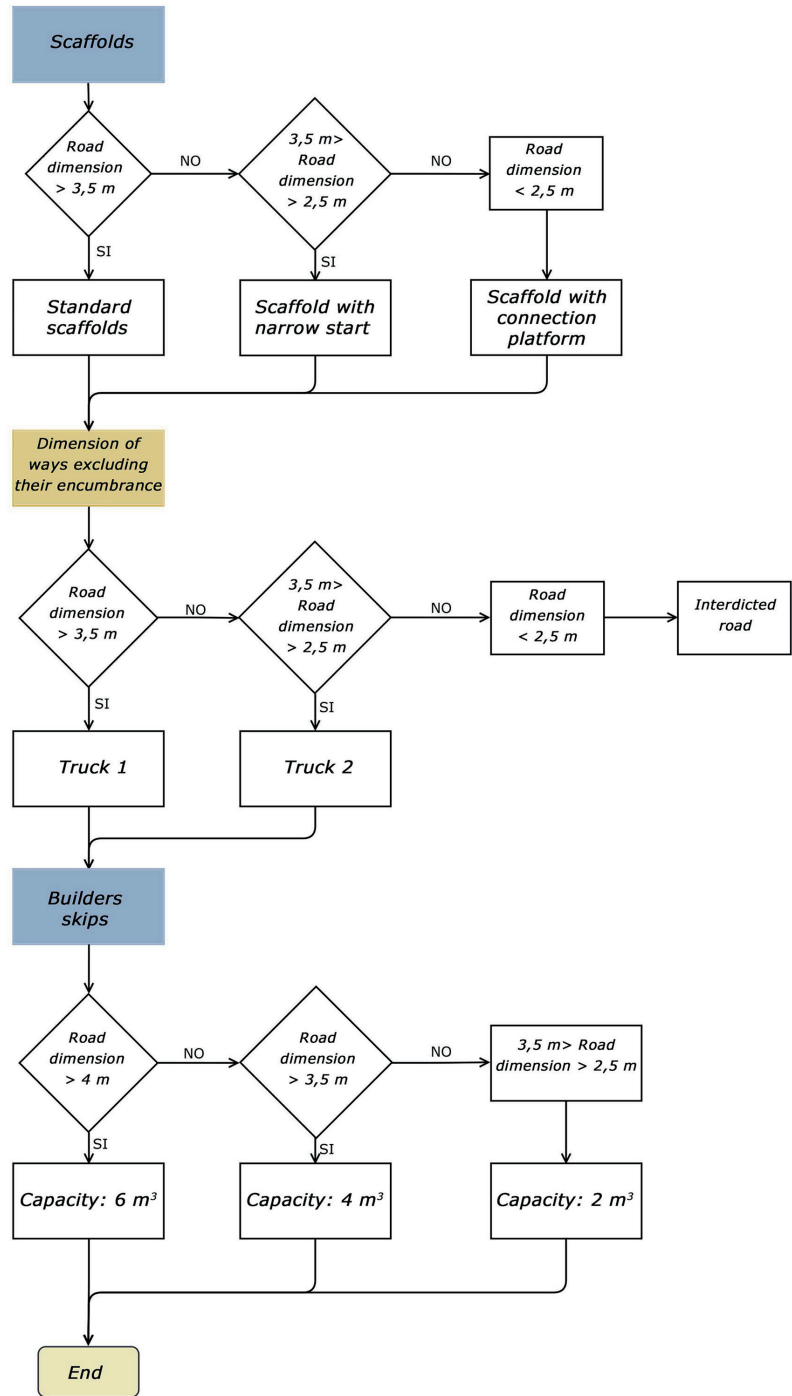


Figure 12: Flow chart

Bibliografia Bibliography

ANGELETTI P., CHERUBINI A., CIFANI G., DE MARCO R., FERRINI M., FISH G., IACOVONE D., LEMME A., PETRINI V., FABRIZI V., SANTORO C., MIOZZI C. (2013). *La Ricostruzione dei centri storici di L'Aquila e delle sue frazioni*, L'Aquila.

ASSESSORATO ALLA RICOSTRUZIONE E PIANIFICAZIONE, Settore Pianificazione e Ripianificazione del territorio, Comune di L'Aquila. (2011). *Il Piano di Ricostruzione dei centri storici di L'Aquila e Frazioni*, L'Aquila.

ASSESSORATO ALLA RICOSTRUZIONE E PIANIFICAZIONE, Settore Pianificazione e Ripianificazione del territorio, Comune di L'Aquila. (2011). *Stralcio degli interventi edilizi diretti nella perimetrazione del Capoluogo*, L'Aquila.

ASSESSORATO ALLA RICOSTRUZIONE, Comune di L'Aquila. (2013). *Criteri operativi per la programmazione della ricostruzione privata nei centri storici del comune di L'Aquila*, L'Aquila.

BARBERO M., *L'emergenza e l'inerzia. Politica e politiche dopo il sisma aquilano*, Tesi di laurea, Dipartimento di Scienze Politiche, Università LUISS Guido Carli.

CAZZANIGA M. (ottobre 2009). "Un nuovo standard antisismico", *Il nuovo cantiere*, n. 7.

COMMISSARIO DELEGATO PER LA RICOSTRUZIONE, a cura di. (2011). *Piano per la gestione delle macerie e rocce da scavo derivanti dagli interventi di prima emergenza e ricostruzione*. L'Aquila, 2011.

DE LUCIA V., DE MARCO R., JOSEF G. F., INNOCENZI R., MORETTI M., PERROTTI A., SECCIA A. (2009). *L'Aquila. Non si uccide così anche una città?*, L'Aquila.

Decreto n. 3 del 9 marzo 2010 del Commissario Delegato per la Ricostruzione, Presidente della Regione Abruzzo.

DI STEFANO, Pietro, a c. di. (2013). *Criteri operativi per la programmazione della ricostruzione privata nei centri storici del comune di L'Aquila*. L'Aquila.

DOLCE M., MANFREDI G., a cura di. (2015). *Libro bianco sulla ricostruzione privata fuori dai centri storici nei comuni colpiti dal sisma dell'Abruzzo del 6 aprile 2009*, Napoli: Doppiovoce Edizioni.

FRISCH G. J., *Il terremoto dell'Aquila. Pianificazione dell'emergenza e urbanistica*, Università di Camerino, Facoltà di Architettura di Ascoli Piceno, 30 gennaio 2010.

GUIZZARDI R., (2010). *Elementi di organizzazione del cantiere e sicurezza nelle attività edili*, Il mio libro.

ComitatusAquilanus, a cura di. (2009). *L'Aquila. Non si uccide così anche una città?*. L'Aquila.

Legge 77 del 24 giugno 2009, Conversione in legge, con modificazioni, del Decreto Legge n. 39 del 28 aprile 2009, recante interventi urgenti in favore delle popolazioni colpite dagli eventi sismici

nella regione Abruzzo nel mese di aprile 2009 e ulteriori interventi urgenti di protezione civile, pubblicata nella Gazzetta Ufficiale n. 147 del 27 giugno 2009.

Linee di indirizzo strategico per la ripianificazione del territorio, a cura della Struttura Tecnica di Missione, L'Aquila, 20 luglio 2010.

MENGOLI G. C. (2014). *Manuale di diritto urbanistico*, Giuffrè.

PICONE M. (1984). *Tecnologia della produzione edilizia metodiche industriali e tecnologie operative per i cantieri edili*. Torino: UTET.

Protocollo di intesa Emergenza sisma Abruzzo 2009: ottimizzazione delle attività relative alle misure per la salute e sicurezza nei cantieri temporanei o mobili, L'Aquila, 30 novembre 2009.

SEVERINO M., DI PASQUALE R. (2002). *Procedure per la ricostruzione post-sisma: analisi e proposte*, Dipartimento della protezione civile.

SETTORE PIANIFICAZIONE E RIPIANIFICAZIONE DEL TERRITORIO, SETTORE EMERGENZA E RICOSTRUZIONE PRIVATA, a cura di. (2011). Osservazioni sul sistema dell'emergenza per una disciplina organica per l'esecuzione degli interventi nei centri storici colpiti dal sisma del 2009. L'Aquila.

UTICA G. (2009). *Progettazione esecutiva, progettazione operativa e sicurezza nei cantieri*, Maggioli editore.

Sitografia Web sites

<http://www.commissarioperlaricostruzione.it>

<http://www.comune.laquila.gov.it>

<http://www.comune.villasantangelo.aq.it>

<http://www.esecptlaquila.it>

<http://www.protezionecivile.gov.it>

<http://www.usra.it>

<http://www.usrc.it>

<http://www.vigilfuoco.it>