Il candidato immagini di dover avviare un laboratorio a sua scelta, nell'ambito della ricerca di Dipartimento, e ipotizzi un budget in termini di materiale, strumentazione e risorse umane. Ne descriva poi un'ipotesi di organizzazione interna elencando tutte le principali attività, con particolare riferimento alla sicurezza e alla qualità delle misure

(Estratta)

Il candidato, scegliendo la tipologia di laboratorio che preferisce, predisponga un possibile piano di gestione delle attività, di didattica, ricerca e conto terzi

Il candidato, scegliendo la tipologia di laboratorio che preferisce, predisponga un possibile piano di sviluppo e implementazione delle attività, con particolare attenzione agli aspetti innovativi e della sostenibilità

1.

1) Il candidato esponga come intende procedere nello sviluppo e progettazione di nuove tipologie di prova, anche in conformità con le norme vigenti.

2) In avvio di laboratorio, il candidato indichi le attività di gestione e utilizzo della strumentazione di laboratorio.

3) Il candidato indichi, in ambito di sicurezza, quali attenzioni rivolgere all'utenza del laboratorio.

How to build the C400 roof

Here the challenge was: how to make the stack of corrugated steel plates work together? The fact that we needed a concrete layer on top for waterproofing (and mass in the roof) already provided coherence. So the following strategy was worked out (fig. 90). In this way I explained the composition of the stacked roof to the draftsmen of ABT so they could make a good tender document drawing.

Unfortunately (as usual) the tendering out to contractors proved that the total price for the Educatorium was too high to fit into the budgets. But the contractor that had the best price already gave a few indications of what had to be skipped to come to a 'better' price. One of these items was the roof of the C400 and the C500 lecture rooms. The contractor's proposal was C400: steel beams with corrugated steel plates on top and C500: flat, prestressed concrete slab of 380 mm thickness. The architects

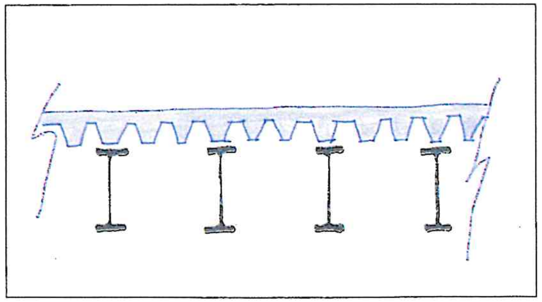

Fig. 91 The cheaper C400 roof

said: 'We will fight for the C500 proposal with the reinforcement coming out of the concrete, but for the C400 you can make a proposal, provided the corrugated steel plates run parallel to the axis of the beams (fig. 91).

In this way the appearance of the C400 kept the recessed character. That way lighting, cables and ducts could be hidden between the IPE beams, positioned rather close to each other.

How to build the C500 roof

The principle of the C500 roof is simple: let the reinforcement bars come out of the concrete at one side and disappear again in the concrete on the other side. The first problem was: where should the bars start to come out and go in. Also this type of roof, in which a concrete slab has to work together with 'loose' steel bars connected to it, is difficult to calculate by computer. Luckily we could get access to a specialized computer program DIANA, developed by the TU Delft, that could handle these kind of structures. We made the first calculation of a flat slab in the configuration of supports as in reality. In this way we could see how the roof would deform (buckle)(fig. 92).

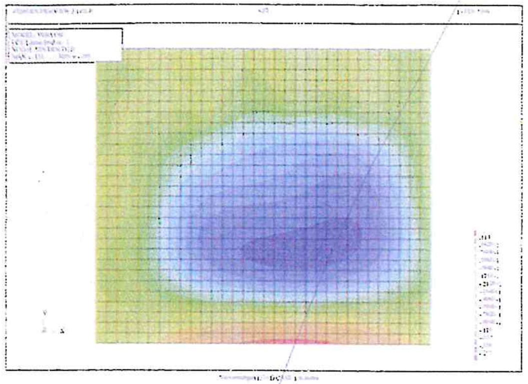

Fig. 92 Computer calculations of the deformation of the C500 roof as a flat slab

The idea behind this approach was to predict where the concrete slab had to be 'strengthened' by steel reinforcement bars coming out of the concrete. Unfortunately the architects were not happy with this 'deformed egg' as they called it and proposed a 'beautiful, symmetric, and regular pattern' in the centre of the C500 lecture room. So the poor structural engineer had to calculate an in-efficient cable net in the wrong position regarding the bending moments. Computers however are patient, and calculated this awkward structure. The price for visual symmetry was a lot of extra reinforcement in the concrete slab, especially

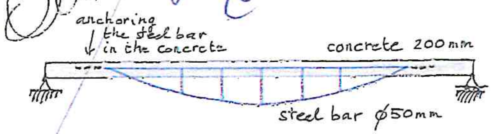

Fig. 93 Prefabricated steel bar element (color blue) for C500 roof.

1) Il candidato descriva come intende organizzare il supporto tecnico agli studenti nella realizzazione di elaborati per tesi e dottorato e per prototipazione.

2) Il candidato descriva l'approccio alla predisposizione di prove o prototipazione seguendo la normativa ISO 9001:2015 – Quality management systems.

3) Il candidato indichi le competenze del RADRL di laboratorio e le attività di formazione da somministrare all'utenza in funzione della strumentazione e delle attività proposte.

2.25 The Unfortunate City Hall, Rotterdam (NL)

2008-2009

Strange to name a city hall 'unfortunate', but in this case I mean unfortunate for myself. Everything that could've gone wrong after a good start went wrong for me in this project. It also presents a lesson: How not to organize a competition for the most sustainable city hall of the world. For that is how we started, how we were challenged by the city's civil servants with the project: 'A new city hall for Rotterdam.' It was a competition for invited architects. I was lucky enough to be asked by OMA. We started looking at the Program of Requirements. The first demand was: the most sustainable city hall of the world. OMA asked how this could be done, regarding the indicated budget. The answer they got was that certain budgets had been increased by 5 to 10% according to what experts had told them. Furthermore the building should be flexible. Parts of it to be used in the future as apartments, later easily to be changed back into offices. This 'simple' demand that everything should be possible, meant that the highest demands should be respected regarding load bearing capacity and, especially, building physical requirements like sound insulation and comfort. But all teams had these devilish criteria so we started with good spirits: we were going to win!

The design process had already developed in the way of the, at that time popular, pixelated buildings. Buildings being built up like a heap of small cubes. The architects at OMA stated that this building should be seen as a dynamic process. The small cubes could be taken away and added 'within reasonable limits'. Who can object against 'reasonable limitations'?, I thought silently and murmured, 'reasonable, aha!' In my mind ideas were already racing to the surface. I had the very same thought as the responsible architect, Reinier de Graaf of OMA, expressed aloud,'a Vierendeel structure, could that be the solution?'

I've given this very uneconomic structural system a lot of thought because I saw the functional advantage: an easy-to-walk-through structure of only horizontal beams and columns (fig. 211). The secret of a Vierendeel structure is that the meeting of beams and columns has to be very strong, lots of steel and welding. The hinge connections midfield can be very little and even a few bolts. Nice for assembling. So figure 212 shows the 'star' proposal.
The OMA people embraced this Vierendeel system built up from

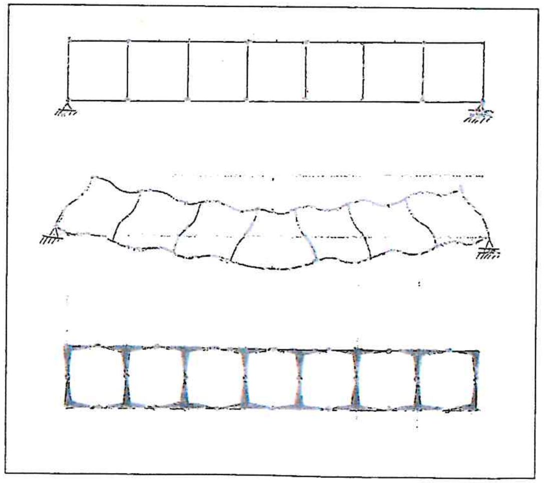

Fig. 211 **The way I explain Vierendeel trusses to students: moment resistant corners and hinges in the midfield of beam and column.**

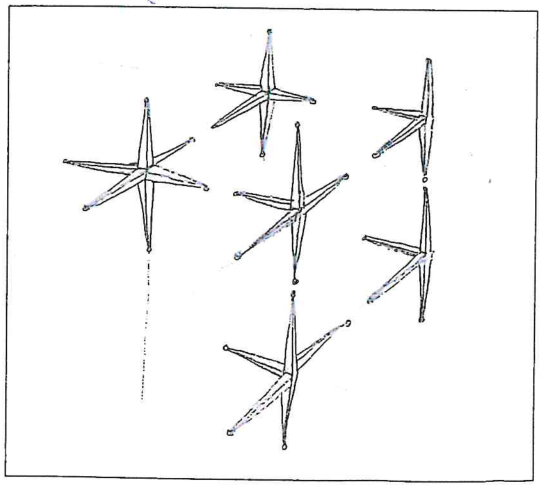

Fig. 212 **The stars to build up a spatial (3D) structural Vierendeel system.**